EXHIBIT A

UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

COBBLESTONE WIRELESS, LLC, *Plaintiff*, v. SAMSUNG ELECTRONICS CO., LTD. and SAMSUNG ELECTRONICS AMERICA, INC. *Defendants*.	Case No. 2:23-cv-00285-JRG-RSP **JURY TRIAL DEMANDED**

SAMSUNG ELECTRONICS CO. LTD. AND SAMSUNG ELECTRONICS AMERICA, INC.'S FIRST SUPPLEMENTAL P.R. 3-3 AND 3-4 INVALIDITY CONTENTIONS

Defendants Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (collectively, "Defendants" or "Samsung") hereby provide the following First Supplemental Preliminary Invalidity Contentions ("Contentions") to Plaintiff Cobblestone Wireless LLC ("Plaintiff" or "Cobblestone") for U.S. Patent Nos. 7,924,802 ("the '802 patent"), 8,891,347 ("the '347 patent"), 9,094,888 ("the '888 patent"), 10,368,361 ("the '361 patent"), and 8,554,196 ("the '196 patent") (collectively, the "Asserted Patents").

I. PRELIMINARY STATEMENT AND RESERVATION OF RIGHTS

In its Infringement Contentions dated September 28, 2023, Cobblestone asserted the following 61 claims[1] (the "Asserted Claims"):

- Claims 1–4, 6–10, 13, 14, 17, and 21–24 of the '802 patent;

[1] Although Cobblestone's infringement contentions originally identified claim 22 of the '802 patent as an asserted claim, Cobblestone provided no claim chart for this claim. Samsung reserves all rights to object to any future amended infringement chart for claim 22 of the '802 patent.

- Claims 1-4, 6-12, 14-17 of the '347 patent;
- Claims 9, 10, 12, 20, 21, and 23 of the '888 patent;
- Claims 10-13, 15, and 17 of the '361 patent;
- Claims 1–5, 7, 10, 12, 14, 17, 18, 20 and 21 of the '196 patent;

Samsung does not provide any Contentions directed to claims that Cobblestone has not asserted for purposes of infringement. To the extent Cobblestone may be permitted to assert additional claims in the future, Samsung reserves all rights to disclose new or supplemental contentions regarding such claims.

Because the same claim scope must apply for both infringement and invalidity, these Contentions are based on Cobblestone's assertions in its Infringement Contentions. Samsung does not thereby implicitly or explicitly agree with Cobblestone's construction of the claims. Samsung reserves all rights to disclose new or supplemental invalidity contentions, including to address any construction of the claims rendered by the Court, changed theories of infringement, and any evidence obtained during the course of discovery.

Subject to the rights reserved in these Contentions, all Asserted Claims are invalid under at least one or more of 35 U.S.C. §§ 102, 103, and/or 112. The Asserted Claims are invalid because they are anticipated and/or rendered obvious under 35 U.S.C. §§ 102 and 103. If Cobblestone contends or a fact-finder finds that one or more limitations of the Asserted Claims are not disclosed in the prior art identified as anticipatory, Samsung reserves the right to assert obviousness based on the identified references and/or to identify other references that would have rendered obvious the allegedly missing limitation. Furthermore, the obviousness combinations of references provided below and in the accompanying claim charts under 35 U.S.C. § 103 are exemplary only

and are not intended to be exhaustive. If or when Cobblestone challenges the disclosure of any of these references with respect to particular limitations of the Asserted Claims, Samsung reserves the right to supplement these Contentions to assert additional or different bases for obviousness. Samsung reserves the right to use any combination of the references set forth in these Contentions to demonstrate the obviousness of the Asserted Claims. Additionally, certain claims of the Asserted Patents are invalid for failure to comply with the written description, enablement, and definiteness requirements of 35 U.S.C. § 112.

Samsung expressly reserves the right to amend, correct, and/or supplement these Contentions in accordance with the Docket Control Order governing this case.

* * *

These Contentions reflect Samsung's knowledge, investigation, and discovery as of the date of service. Samsung reserves the right to supplement these Contentions as appropriate and for any permissible reason. For example, pursuant to the Docket Control Order, Samsung reserves the right to supplement these Contentions after subsequent case events, including any disclosure by Cobblestone of amended or supplemental infringement contentions, any ruling by the Court on claim construction, or in response to arguments made and positions taken by Cobblestone during fact and expert discovery. Samsung also reserves the right to supplement these Contentions if it becomes aware of additional prior art, becomes aware of additional features of the prior art references cited below, or becomes aware of any other relevant information through discovery, including non-party discovery, or otherwise. Samsung also reserves the right to modify or supplement its Contentions based on the Court's construction of the claims.

In addition to the charts attached hereto, Samsung expressly incorporates by reference, as if expressly set forth in these Contentions, all invalidity positions, prior art, and claim charts asserted against Cobblestone in any Cobblestone lawsuit or IPR proceeding by Samsung, prior defendants, petitioners, and potential or actual licensees to the Asserted Patents. Samsung also incorporates any future discovery responses and expert reports in such litigations or proceedings.

Samsung's citations to disclosures in any particular prior art reference are not (and are not intended to be) exhaustive but rather illustrative. Samsung reserves the right to rely on uncited portions of the prior art references and on other publications and expert testimony as aids in understanding and interpreting the cited portions, as providing context thereto, as additional evidence that the prior art discloses a claim limitation or the alleged invention as a whole, as evidence of the state of the art at a particular time, as evidence of the obviousness factor of contemporaneous development by others, and as evidence of motivation to combine. Samsung also reserves the right to rely on uncited portions of the prior art references, other publications, and testimony, including expert testimony, to establish bases for combination of prior art references that render the charted claims obvious. Due to the related nature of the Asserted Patents, Samsung also reserves the right to rely on any cited portions of a prior art reference for one Asserted Patent against all Asserted Patents. Samsung also reserves the right to rely upon any documentary or testimonial evidence of the existence of any systems that embodied or practiced the disclosures found in the accompanying invalidity charts, for example as discussed in the prior art references cited herein, as such systems may qualify as prior art under 35 U.S.C. § 102(g).[2]

[2] Citations herein refer to the pre-AIA version of Title 35 of the U.S. Code.

Samsung intends to rely on admissions concerning the scope of the prior art relevant to the Asserted Patents found in, *inter alia*: the patent prosecution histories for the Asserted Patents and related patents and/or patent applications (including all prior art cited therein); any deposition testimony of the named inventors on the Asserted Patents and related patents and/or patent applications in this matter or any other matter; evidence and testimony relating to the level of skill in the art; and the papers filed and any evidence submitted by Cobblestone in connection with this matter.

Samsung reserves the right to assert that the Asserted Claims are invalid under 35 U.S.C. § 102(f) in the event Samsung obtains additional evidence that the inventors named in any of the Asserted Patents did not invent the subject matter claimed therein. Should Samsung obtain such evidence, it will provide the name of the person(s) from whom and the circumstances under which the alleged invention or any part of it was derived.

These Contentions are not intended to include or otherwise reflect Samsung's claim interpretations. Because the Court has not yet construed any of the claims in this litigation, Samsung bases these Contentions at least on its present understanding of Cobblestone's view and application of the claim scope, to the extent that view can be inferred from Cobblestone's actual and/or apparent application of those claims. But Samsung does not adopt any constructions or interpretations impliedly or expressly in these Contentions. Moreover, Samsung's Contentions may reflect alternative positions as to claim construction and scope.

For the purposes of these Contentions, Samsung has made assumptions regarding possible meanings of indefinite claim terms. By making these assumptions, Samsung does not admit that any claim language satisfies 35 U.S.C. § 112. Similarly, the use of asserted claim terms herein

should not be understood to mean that such terms, as used in the Asserted Patents or claims thereof, are definite or otherwise comply with the conditions of patentability under 35 U.S.C. § 112. Likewise, the use of asserted claim terms herein should not be understood to suggest or imply a common, usual, ordinary, customary, plain, or accepted meaning in the art for any such terms.

By providing these Contentions, Samsung is not waiving nor limiting its rights to make arguments in the future about the proper scope of the claims or to advance alternative constructions to those Cobblestone advocates. Samsung expressly reserves the right to argue for such alternative claim constructions during this litigation and to supplement these Contentions after the Court has issued a claim construction ruling.

Samsung's factual investigations, including its investigation of prior art and grounds for invalidity, is ongoing. Further, Samsung's invalidity positions will be the subject of expert testimony. Samsung reserves the right to supplement these Contentions, including, without limitation, adding additional prior art and grounds of invalidity in accordance with the Federal Rules of Civil Procedure and Docket Control Order in this case, or otherwise.

II. PERSON HAVING ORDINARY SKILL IN THE ART

A person of ordinary skill in the art ("POSITA" or "POSA"), on or about:

- January 23, 2008 for the '802 patent,
- July 28, 2011 for the '347 patent,
- April 29, 2011 for the '888 patent,
- August 1, 2014 for the '361 patent, and
- August 24, 2011 for the '196 patent

would have had at least a Bachelors's degree in Computer Science, Electrical Engineering, or a related field, and three to five years of experience in services and application implementation in communication networks. Additional graduate education could substitute for professional experience, and vice versa.

III. IDENTIFICATION OF RELEVANT PRIOR ART

A. Priority Dates

Cobblestone has not yet alleged that any Asserted Claim in any Asserted Patent is entitled to a priority date earlier than the filing date of each Asserted Patent. To the extent that Cobblestone attempts ot assert an earlier priority date for any Asserted Claim, Samsung reserves the right to amend this disclosure to address any such claim.

B. Prior Art Patent Publications

Based on their investigation to date, Samsung has provided in the list below the prior art patent publications presently known to Samsung that it contends anticipate and/or render obvious the Asserted Claims. The prior art identified in these Contentions discloses (i.e., anticipates and/or renders obvious) the elements of the Asserted Claims either explicitly or inherently. Similarly, the prior art patent publications listed on the face of the Asserted Patents discloses (i.e., anticipates and/or renders obvious) the elements of the Asserted Claims either explicitly or inherently, and Samsung reserves the right to rely on any such reference.

Prior-art patents or publications included in these Contentions may be related (such as a divisional, continuation, continuation-in-part, parent, or child) to earlier or later-filed patents or publications, may have counterparts filed in other jurisdictions, or may incorporate (or be incorporated by) other patents or publications by reference. The listed patents or publications are

intended to be representative of these other patents or publications to the extent they exist. Samsung accordingly reserves the right to modify, amend, or supplement these Contentions with these related patents or publications, as well as other prior art references, upon further investigation. Additionally, any reference in these Contentions, including the appendices and exhibits thereto, to a specific subsection or subsections of 35 U.S.C. § 102, is merely exemplary, and Samsung expressly reserves the right to rely on additional or other sections of 35 U.S.C. § 102, as appropriate. If Cobblestone asserts that one or more of these references or systems fails to disclose one or more elements of a claim, Samsung reserves the right to also use those references to invalidate the claim under 35 U.S.C. § 103.

Discovery is ongoing, and Samsung's prior art investigation and third-party discovery is therefore not yet complete. Samsung reserves the right to present additional items of prior art under 35 U.S.C. §§ 102 and/or 103 that are located during the course of discovery or further investigation. For example, Samsung expects to receive documents from additional third parties either through informal requests or under subpoenas that are believed to have knowledge, documentation, and/or corroborating evidence concerning some of the prior art listed and discussed below. These third parties include without limitation the authors, inventors, or assignees of the references listed in these disclosures.

Name	Country of Origin	Publication/Issue Date
U.S. Patent Application Publication No. 2005/0249266 ("Brown-266")	US	November 10, 2005
U.S. Patent Application Publication No. 2009/0052556 ("Fernandez")	US	February 26, 2009
U.S. Patent Application Publication No. 2005/0135312 ("Montojo")	US	June 23, 2005

U.S. Patent Application Publication No. 2006/0276146 (“Suzuki”)	US	December 7, 2006
U.S. Patent No. 7,162,218 (“Axness-218”)	US	January 9, 2007
U.S. Patent Application Publication No. 2006/0233147 (“Karabinis”)	US	October 19, 2006
U.S. Patent No. 6,529,715 (“Kitko”)	US	March 4, 2003
U.S. Patent Application Publication No. 2006/0212773 (“Aytur”)	US	September 21, 2006
U.S. Patent Application Publication No. 2006/0281487 A1 (“Girardeau”)	US	December 14, 2006
U.S. Patent Application Publication No. 2007/0004350 A1 (“Yoon”)	US	January 4, 2007
U.S. Patent Application Publication No. 2007/0004351 A1 (“Dekker”)	US	January 4, 2007
JP 2007258904A (“Nakayama-JP”)	JP	October 4, 2007
U.S. Patent No. 7,885,344 , U.S. Patent Application Publication No. 2007/0223608 A1 (“Nakayama”)	US	September 27, 2007
US 7,145,934 (“Liang”)	US	December 5, 2006
U.S. Patent No. 8,036,702 (“Etemad”)	US	October 11, 2011
U.S. Patent No. 6,876,645 (“Guey”)	US	April 5, 2005
U.S. Patent No. 6,920,185 (“Hinson”)	US	July 19, 2005
WIPO Patent Application Publication No. 2005/109917 (“Laroia”)	US	November 17, 2005
U.S. Patent No. 8,204,452 (“Lin”)	US	June 19, 2012
U.S. Patent No. 9,830,642 (“Chang”)	US	November 28, 2017
U.S. Patent Application Publication No. 2006/0286974 (“Gore”)	US	December 21, 2006
U.S. Patent Application Publication No. 2008/0028395 (“Motta”)	US	January 31, 2008
U.S. Patent Application Publication No. 2009/0249321 (“Mandayam”)	US	October 1, 2009
U.S. Patent Application Publication No. 2012/0046022 (“Kalke”)	US	February 23, 2012
U.S. Patent Application Publication No. 2012/0157038 (“Menezes”)	US	June 21, 2012

U.S. Patent Application Publication No. 2012/0215890A1 (“Doyle”)	US	August 23, 2012
EP 1104211 A2 (“Chen”)	EU	May 30, 2001
U.S. Patent No. 6,697,644 (“Scherzer”)	US	February 24, 2004
U.S. Patent No. 7,596,387 (“Goldberg”)	US	September 29, 2009
U.S. Patent No. 8,213,994 (“Cave”)	US	July 3, 2012
U.S. Patent Application Publication No. 2007/0275761 A1 (“Jin”)	US	November 29, 2007
U.S. Patent Application Publication No. 2013/0331081 A1 (“Rune”)	US	December 12, 2013
U.S. Patent No. 7,720,509 (“Famolari”)	US	May 18, 2010
U.S. Patent No. 8,094,572 (“Hulbert”)	US	January 10, 2012
U.S. Patent No. 8,229,506 (“Duet”)	US	July 24, 2012
U.S. Patent No. 8,842,525 (“Kim”)	US	September 23, 2014
U.S. Patent No. 9,179,319 (“Gore”)	US	November 3, 2015
U.S. Patent Application Publication No. 2004/0162115 A1 (“Smith”)	US	August 19, 2004
U.S. Patent Application Publication No. 2005/0261028 A1 (“Chitrapu”)	US	November 24, 2005
U.S. Patent Application Publication No. 2008/0153501 A1 (“Harris”)	US	June 26, 2008
U.S. Patent Application Publication No. 2011/0038308 A1 (“Song”)	US	February 17, 2011
U.S. Patent No. 8,971,841 (“Menezes”)	US	March 3, 2015
U.S. Patent No. 9,830,642 to Chang et al. (“Chang”)	US	November 28, 2017
U.S. Patent No. 8,752,044 to Motta et al. (“Motta”)	US	June 10, 2014
U.S. Patent No. 9,600,261 to Mandyam et al. (“Mandyam”)	US	March 21, 2017
U.S. Patent No. 9,179,319 to Gore et al. (“Gore”)	US	November 3, 2015
U.S. Patent No. 6,996,418 to Teo et al. (“Teo”)	US	February 7, 2006

U.S. Patent No. 9,143,552 to Bonner et al. ("Bonner")	US	September 22, 2015
U.S. Patent No. 10,079,912 to Boudreau et al. ("Boudreau")	US	September 18, 2018
United Kingdom Patent No. 201,016,415 to Samsung Electronics Co Ltd. ("Samsung")	U.K.	February 27, 2013
U.S. Patent No. 7,684,802 to Jalali ("Jalali")	US	March 23, 2010
U.S. Patent Application Publication No. 2008/0010372 to Khedouri et al. ("Khedouri")	US	January 10, 2008
U.S. Patent No. 8,169,933 to Srinivasan et al. ("Srinivasan")	US	May 1, 2012
Japanese Patent Application 2010-128844 to Koishikawa ("Koishikawa")	Japan	June 10, 2010
Canadian Patent No. 2,693,711 to Madej et al. ("Madej")	Canada	August 27, 2010
World Intellectual Property Organization International Application No. 2008/094579 to Bianconi et al. ("Bianconi")	US	August 7, 2008
Provisional application No. 61/451,057 to Chang ("Chang Prov.")	US	March 9, 2011
U.S. Patent Application No. 2012/0215890 to Doyle et al. ("Doyle")	US	August 23, 2012
U.S. Patent 8,433,310 to Kalke et al. ("Kalke")	US	April 30, 2013
U.S. Patent Application No. US 2008/0160983 to Poplett et al. ("Poplett")	US	July 3, 2008
U.S. Patent Application No. US 2009/0170537 ("Mauti")	US	July 2, 2009
U.S. Patent No. 9,161,360 ("Banu")	US	October 13, 2015
U.S. Patent No. 8,285,291 ("Dinan")	US	October 9, 2012
U.S. Patent No. 5,615,409 ("Forssen")	US	March 25, 1997
U.S. Patent No. 8,554,196 ("Wong")	US	October 8, 2013
U.S. Patent Application No. 2012/0170513A1 ("Vogedes")	US	July 5, 2012

U.S. Patent No. 8,666,364 B2 (“Raleigh”)	US	March 4, 2014
U.S. Patent No. 8,590,023 B2 (“Gupta”)	US	November 19, 2013
U.S. Patent No. 7,821,985 B2 (“Megen”)	US	October 26, 2010
U.S. Patent No. 6,785,513 (“Sivaprakasam”)	US	August 31, 2004
U.S. Patent No. 6,983,147 (“Hans”)	US	January 3, 2006
U.S. Patent No. 7,046,978 (“Burke”)	US	May 16, 2006
U.S. Patent No. 7,688,979 (“Reznik”)	US	March 30, 2010
U.S. Patent No. 7,738,925 (“Nguyen”)	US	June 15, 2010
U.S. Patent No. 8,509,334 (“Lindgren-334”)	US	August 13, 2013
U.S. Patent No. 8,831,523 (“Damnjanovic”)	US	September 9, 2014
U.S. Patent Application Publication No. 2003/0153360 (“Burke”)	US	August 14, 2003
U.S. Patent Application Publication No. 2006/0210070 (“Reznik”)	US	September 21, 2006
U.S. Patent Application Publication No. 2008/0095251 (“Yeh”)	US	April 24, 2008
U.S. Patent Application Publication No. 2010/0215113 (“Lindgren-113”)	US	August 26, 2010
U.S. Patent Application Publication No. 2010/0284303 (“Catovic”)	US	November 11, 2010
EP 2556712 B1 (“Lunttila”)	EU	February 13, 2013
U.S. Patent No. 6,996,380 (“Dent-380”)	US	February 7, 2006
U.S. Patent No. 7,184,492 (“Dent-492”)	US	February 27, 2007
U.S. Patent No. 7,778,607 (“Withers”)	US	August 17, 2010
US 2009/0122854 A1 (“Zhu”)	US	May 14, 2009
EP 1998464 A1 (“Zirwas”)	EU	March 12, 2008
WO 2006/024312 A1 (“Auer”)	EU	March 9, 2006
EP 1710968 A1 (“Schulz”)	EU	October 11, 2006
WO 2011/026231 A1 (“Nikopourdeilami”)		March 10, 2011
U.S. Patent No. 7,155,165 (“Kowalewki”)	US	December 26, 2006

U.S. Patent No. 8,699,603 ("Baligh")	US	April 15, 2014
U.S. Patent Application Publication No. 2009/0221314 ("Hu")	US	September 3, 2009
U.S. Patent Application Publication No. 2003/0153360 ("Burke")	US	August 14, 2003
U.S. Patent Application Publication No. 2006/0210070 ("Reznik")	US	September 21, 2006
U.S. Patent Application Publication No. 2008/0095251 ("Yeh")	US	April 24, 2008
U.S. Patent Application Publication No. 2010/0215113 ("Lindgren")	US	August 26, 2010
U.S. Patent Application Publication No. 2011/0151778 ("Lim")	US	June 23, 2011
World Intellectual Property Organization Patent Application Publication No. WO 01/37442 ("Gustrau")	Germany	May 25, 2001
German Patent No. DE 19131298 ("Kowalewski")	Germany	January 9, 2003
Korean Patent No. KR 20070100101 ("Wook")	South Korea	October 10, 2007
U.S. Patent Application Publication No 20100322227 ("Tao")	US	December 23, 2010
U.S. Patent No. 6,983,147 ("Hans")	US	January 3, 2006
EP2556712B1	Multiple	May 4, 2011
U.S. Patent No. 8,654,815 ("Forenza")	US	February 18, 2014
U.S. Patent Application No. 2004/0095907 ("Agee")	US	May 20, 2004
U.S. Patent Application No. 2010/0284351 ("Liang")	US	November 11, 2010
U.S. Patent Application No. 2011/0255613A1("Xia")	US	October 20, 2011
WO2010079748A1	JP	July 15, 2010
U.S. Patent Application No. 2006/0072683 ("Kent")	US	April 6, 2006
WO2011049415A2	KR	April 28, 2011
CN101483503A	CN	July 15, 2009
U.S. Patent Application Publication No. 2004/0176094 ("Kim")	US	September 9, 2004

U.S. Patent Application Publication No. 2005/0073977 (“Vanghi”)	US	April 7, 2005
U.S. Patent Application Publication No. 2006/0111149 (“Chitrapu-149”)	US	May 25, 2006
U.S. Patent Application Publication No. 2009/0298502 (“Hagerman”)	US	December 3, 2009
U.S. Patent Application Publication No. 2010/0099416 (“Kazmi”)	US	April 22, 2010
U.S. Patent No. 7,684,802 (“Jalali”)	US	March 23, 2010
U.S. Patent Application Publication No. 2004/0063430 A1 (“Cave”)	US	April 1, 2004
U.S. Patent Application Publication No. 2008/0181180 A1 (“Karaoguz-180”)	US	July 31, 2008
U.S. Patent No. 6,240,290 (“Willingham”)	US	May 29, 2001
U.S. Patent No. 7,945,263 (“Noll”)	US	May 17, 2011
U.S. Patent No. 9,521,597 (“Goransson-597”)	US	December 13, 2016
U.S. Patent Application Publication No. 2005/0070285 A1 (“Goransson-285”)	US	March 31, 2005
U.S. Patent Application Publication No. 2010/0296487 A1 (“Karaoguz-487”)	US	November 25, 2010
EP 2273821 A1 (“Fahldieck”)	EU	January 12, 2011
WO 2001/039524 A2 (“Thomas”)	US	May 31, 2001
U.S. Patent No. 6,580,910 (“Mazur”)	US	June 17, 2003
U.S. Patent No. 7,336,953 (“Kim-953”)	US	February 26, 2008
U.S. Patent Publication No. 2004/0176094 (“Kim-094”)	US	September 9, 2004
U.S. Patent No. 7,657,288 (“Chitrapu”)	US	February 2, 2010
U.S. Patent No. 8,489,093 (“Souissi”)	US	July 16, 2013
U.S. Patent No. 9,002,362 (“Marce”)	US	April 7, 2015
U.S. Patent No. 9,113,379 (“Jung”)	US	August 18, 2015

U.S. Patent No. 9,426,712 ("Hagerman")	US	August 23, 2016
U.S. Patent Publication No. 2009/0298502 ("Hagerman-502")	US	December 3, 2009
U.S. Patent Application Publication No. 2002/0137538 ("Chen")	US	September 26, 2002
U.S. Patent Application Publication No. 2005/0070285 ("Goransson")	US	March 31, 2005
U.S. Patent Application Publication No. 2008/0181180 ("Karaoguz")	US	July 31, 2008
Chinese Patent No. CN101217819 ("Li")	China	July 9, 2008
U.S. Patent Publication No. US20110206009A1 ("Attar")	US	August 25, 2011
U.S. Patent No. 7,289,826 ("Hovers")	US	October 30, 2007
Chinese Patent No. CN 101917747 ("Huawei")	China	December 15, 2010
U.S. Patent Application No. 2010/0113002A1 ("Joko")		May 6, 2010
WO 2009/079316 ("Motorola")	WIPO	June 25, 2009
U.S. Patent Application No. 2010/0291931A ("Suemitsu")	US	November 18, 2010
U.S. Patent No. 10,057,901 ("Zhang")	US	August 21, 2018
U.S. Patent Application Publication No. 2010/0034157 ("Stolyar")	US	February 11, 2010
U.S. Patent Application Publication No. 2014/0341051 ("Gaal")	US	November 20, 2014
U.S. Patent Application Publication No. 2015/0365941 ("Liu")	US	December 17, 2015
U.S. Patent Application Publication No. 2017/0055257 ("Zhang")	US	February 23, 2017
WO 2009/050649A2 ("Ho")	TW	April 23, 2009
U.S. Patent No. 7,826,850 B2 ("Matoba")	US	November 2, 2010
U.S. Patent No. 9,276,710 B2 ("Damnjanovic")	US	March 1, 2016
U.S. Patent No. 9,392,611 B2 ("Zhou")	US	July 12, 2016
U.S. Patent Application Publication No. 2011/0176445 A1 ("Chen")	US	July 21, 2011

U.S. Patent Application Publication No. 2013/0188564 A1 ("Yu")	US	July 25, 2013
U.S. Patent No. 7,969,859 B2 ("Khan")	US	June 28, 2011
U.S. Patent No. 8,010,049 B2 ("Kawasaki")	US	August 30, 2011
U.S. Patent No. 8,290,503 B2 ("Sadek")	US	October 16, 2012
U.S. Patent No. 8,576,738 B2 ("Chen")	US	November 5, 2013
U.S. Patent No. 9,768,938 B2 ("Nogami")	US	September 19, 2017
U.S. Patent No. 10,111,241 B2 ("Balck")	US	October 23, 2018
U.S. Patent Application Publication No. 2008/0013480 A1 ("Kapoor")	US	January 17, 2008
U.S. Patent Application Publication No. 2010/0124181 A1 ("Hosein")	US	May 20, 2010
U.S. Patent Application Publication No. 2012/0099467 A1 ("Yamazaki")	US	April 26, 2012
U.S. Patent Application Publication No. 2012/0207124 A1 ("Liu")	US	August 16, 2012
U.S. Patent Application Publication No. 2013/0244681 A1 ("Ookubo")	US	September 19, 2013
EP 1453337 A1 ("Zirilli")	EU	September 1, 2004
WO 2007/043827 A1 ("Kang")	KR	April 19, 2007
WO 2008/090414 A2 ("Freen")	US	July 31, 2008
U.S. Patent Publication No. 2017/0055257 ("Zhang-257")	US	February 23, 2017
International Patent Publication No. WO2009/050649 ("Ho-649")	WIPO	April 23, 2009
U.S. Patent No. 9,713,026 ("Gaal- 026")	US	July 18, 2017
U.S. Patent No. 8,428,011 ("Inoue-011")	US	April 23, 2013
U.S. Patent Publication. No. 2015/0365941 ("Liu-941")	US	December 17, 2015

U.S. Patent No. 10,057,901 ("Zhang-901")	US	August 21, 2018
U.S. Patent No. 10,963,304 ("Wilkes-304")	US	March 30, 2021
U.S. Patent No. 9,775,071 ("Chen-071")	US	September 26, 2017
U.S. Patent No. 9,635,668 ("Golitschek Edler von Elbwart-668")	US	April 25, 2017
U.S. Patent No. 9,036,580 ("Yin-580")	US	May 19, 2015
U.S. Patent Publication No. 2016/0219613 ("Lei-613")	US	July 28, 2016
U.S. Patent Publication No. 2016/0183308 ("Eriksson-308")	US	June 23, 2016
U.S. Patent Publication No. 2013/0010718 ("Horn-718")	US	January 10, 2013
U.S. Patent Publication No. 2013/0215784 ("Nordström-784")	US	August 22, 2013
U.S. Patent Publication No. 2016/0119840 ("Loehr-840")	US	April 28, 2016
U.S. Patent No. 8,295,779 ("Cave")	US	October 23, 2012
U.S. Patent No. 9,185,620 ("Khoryaev")	US	November 10, 2015
U.S. Patent Application Publication No. 2017/0055257 A1 ("Nanchang")	US	February 23, 2017
U.S. Patent No. 7,742,388 ("Shearer")	US	January 26, 2006
U.S. Patent No. 6,516,206 ("Jäntti")	US	November 1, 2001
U.S. Patent Application Publication No. 2007/0081613 ("Kim-613")	US	April 12, 2007
U.S. Patent Application Publication No. 2005/0237923 ("Balakrishnan")	US	October 27, 2005
U.S. Patent No. 8,416,879 ("Rofougaran")	US	June 7, 2007
U.S. Patent Application Publication No. 2010/0062726 ("Zheng")	US	March 11, 2010
U.S. Patent No. 8,693,525 ("Rick")	US	January 17, 2008

U.S. Patent No. 6,952,454 ("Jalali")	US	October 4, 2005
U.S. Patent No. 6,359,868 ("Chen-868")	US	March 19, 2002

C. **Prior Art Non-Patent Publications**[3,4]

Name	Publication Date
G. Garofalo et al, Equipment for On-Board Processing Payloads – Developments in the Frame of the ESA OBP Program, 2000 AMERICAN INSTITUTE OF AERONAUTICS & ASTRONAUTICS	2000
Mattias Wennstrom et al., EEffects of Nonlinear Distortion on Switched Multibeam FDMA Systems, IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION, Volume 51, No. 3 ("Wennström")	March 2003
R. Aquilué et al., Channel Estimation for Long Distance HF Communications based on OFDM Pilot Symbols, COMMUNICATIONS AND SIGNAL THEORY ("Aquilué")	2006
T. Cornish, Single-Aperture Multiple-Carrier Uplink Using a 20 Kilowatt X-Band Transmitter, TMO Progress Report 42-144	February 15, 2001
Mats Johansson et al., Linearization of Multi-Carrier Power Amplifiers, IEEE, by Mats Johansson et al.("Johansson")	1993
Max Martone, Space-time Open Architectures for Braodband Wireless Data Communications: Above the Log2(1+SNR) Bit/Sec.Hz Barrier, GLOBECOM	2000
Zhou Qi et al., Digital Multi-channel Combination in Transmitter Design, 2004 4th Int'l Conf. on Microwave and Millimeter Wave Tech. Proceedings	2004

[3] Any discussion of a non-patent publication in either Section III.C or in one of the claim charts included herewith that discloses a corresponding product or system shall also apply with equal force to the underlying product or system. In other words, both the non-patent publication and the underlying product or system themselves qualify as prior art in the context that they are used herein.

[4] Discovery is currently ongoing, and Samsung will supplement these Contentions with respect to the public availability, as necessary, of any non-patent publication if and when more information becomes available. Indeed, Samsung expects to receive documents from third parties either through informal requests or under subpoenas that are believed to have knowledge, documentation, and/or corroborating evidence concerning the public availability of the identified non-patent publications.

Jianfeng Wang, Enhancing the Performance of Medium Access Control for WLANs with Multi-beam Access Point, IEEE Transactions on Wireless Comms., Vol. 6 No. 2	February 2007
R1-101123	February 2010
Peng Jiang et al., Self-organizing relay stations in relay based cellular networks, Computer Communications 31	March 5, 2008
3GPP TR 36.814 V1.7.2	February 2010
Zhouyue Pi et al., An Introduction to Millimeter-Wave Mobile Broadband Systems, Topics in Radio Communications	June 2011
Dimitris Stamatelos et al., Multiple Access Capability of Indoor Wireless Networks Using Spatial Diversity, PIMRC WCN	1994
R1_093967	October 2009
R1-100904	February 2010
Android 2.3.4 User's Guide	May 20, 2011
DroidWall v1.5.2	July 20, 2011
About the NYTimes iPhone Application, NYTimes.com, available at https://web.archive.org/web/20090416094313/http://www.nytimes.com/ref/membercenter/iphonefaq.html?pagewanted=print	July 11, 2008
Wireless Communications, Theodore S. Rappaport (2002) ("Rappaport").	2002
LTE: The UMTS Long Term Evolution From Theory to Practice by Sesia et al. ("Sesia")	July 22, 2011
LTE for UMTS OFDMA and SC-FDMA Based Radio Access by Holma & Toskala ("Holma & Toskala (2009)")	2009
UMTS Networks Architecture, Mobility, and Services by Kaaranen et al. ("Kaaranen")	2001
WCDMA for UMTS by Holma and Toskala ("Holma & Toskala (2004)")	2004
LTE for UMTS: Evolution to LTE-Advanced Second Edition ("Holma & Toskala (2011)"	March 2011
4G LTE/LTE-Advanced for Mobile Broadband by Dahlman and Parkvall ("Dahlman and Parkvall")	March 20, 2011
LTE-Advanced: A Practical Systems Approach to Understanding 3GPP LTE Releases 10 and 11 Radio Access technologies by Ahmadi ("Ahmadi")	October 13, 2010
An Introduction to GSM by Redl ("Redl")	1995
iPhone User Guide	At least by June 29, 2007

Auto Update, n.a., AVC.com (https://avc.com/2010/11/auto- update/)	November 11, 2010
iPhone 3G User Guide	July 11, 2008
iPhone 3S User Guide	At least by July 11, 2008
iPhone 4 User Guide	At least by June 19, 2009
iPhone 4S User Guide	At least by June 24, 2010
iPhone iOS 3.1 User Guide	September 9, 2009
iPhone iOS 4.2 and 4.3 User Guide	March 9, 2011
Droidwall Source Code Version 1.0 (http://web.archive.org/web/20110103025238/http:/droidwall.googlecode.com:80/svn/trunk/src/com/googlecode/droidwall/Api.java)	At least as of January 3, 2011
3GPP TR 21.900 v10.0.0	March 2011
3GPP TR 21.905 v10.3.0	March 2011
3GPP TS 36.101 v10.3.0	June 2011
3GPP TS 36.133 v10.3.0	June 2011
3GPP TS 36.211 v10.2.0	June 2011
3GPP TS 36.212 v10.2.0	June 2011
3GPP TS 36.213 v10.2.0	June 2011
3GPP TS 36.214 v10.1.0	March 2011
3GPP TS 36.300 v10.4.0	June 2011
3GPP TS 36.302 v10.2.0	June 2011
3GPP TS 36.321 v10.2.0	June 2011
3GPP TS 36.331 v10.2.0	June 2011
3GPP TS 36.912 v9.0.0	September 2009

3GPP TS 36.913 v9.0.0	December 2009
R1-090596	February 2009
R1-103910	June 2010
Fanghua Weng, Channel Estimation for the Downlink of 3GPP-LTE Systems, IC-NIDC2010	2010
R1-101290	February 2010
Kainam T. Wong, Root-MUSIC-Based Direction-Finding and Polarization Estimation Using Diversely Polarized Possibly Collocated Antennas, IEEE Antennas and Wireless Propagation Letters, Vol. 3	2004
Jihoon Choi, Adaptive MIMO Decision Feedback Equalization for Receivers With Time-Varying Channels, IEEE Transactions on Signal Processing, Vol. 53, No. 11	November 2005
Maximum likelihood, ESPRIT, and periodogram frequency estimation of radar signals in K-distributed clutter, by Fulvio Gini, Monica Montanari, and Lucio Verrazzani; Signal Processing, Volume 80, Issue 6 (“Gini”)	2000
SAGE algorithm for channel estimation and data detection with tracking the channel variation in MIMO system, by T. Someya and T. Ohtsuki; IEEE Global Telecommunications Conference, 2004. GLOBECOM '04 (“Someya & Ohtsuki”)	January 17, 2005
Osseiran et al., Refined Radio Innovation Areas for IMT- Advanced within the WINNER+ Project (“Osserian”)	2010
3GPP TS 36.211 v10.2.0	June 22, 2011
3GPP TS 36.211 v10.1.0	March 30, 2011
3GPP TS 36.212 v10.2.0	June 22, 2011
3GPP TS 36.212 v10.1.0	March 30, 2011
3GPP TS 36.213 v10.2.0	June 22, 2011
3GPP TS 36.213 v10.1.0	March 30, 2011
3GPP TS 36.101 v10.3.0	June 21, 2011
3GPP TS 36.101 v10.2.1	April 27, 2011

3GPP TS 36.300 v10.4.0	June 24, 2011
3GPP TS 36.300 v10.3.0	April 5, 2011
3GPP TS 36.300 v10.2.0	December 21, 2010
3GPP TS 36.133 v 10.3.0	June 21, 2011
3GPP TS 36.133 v10.2.0	April 12, 2011
3GPP TS 36.133 v10.1.0	January 6, 2011
3GPP TS 36.331 v.10.2.0	July 24, 2011
3GPP TS 36.331 v10.1.0	March 30, 2011
3GPP TR 21.900 v10.0.0	April 4, 2011
3GPP TR 21.905 v10.3.0	March 28, 2011
3GPP TS 36.214 v10.1.0	March 30, 2011
3GPP TS 36.302 v10.2.0	June 24, 2011
3GPP TS 36.321 v10.2.0	June 24, 2011
3GPP TR 25.913 v9.0.0	December 28, 2009
R1-101711	April 8, 2010
R1-100889	February 16, 2010
R1-100926	February 16, 2010
R1-101429	February 16, 2010
R1-101465	February 17, 2010
R1-101488	February 16, 2010
R1-101217	February 16, 2010
R1-101129	February 16, 2010

R1-101162	February 16, 2010
R1-101218	February 16, 2010
R1-100852	February 16, 2010
R1-100927	February 17, 2010
R1-101625	March 1, 2010
R1-101683	March 1, 2010
R1-101061	February 16, 2010
R1-101382	February 17, 2010
R1-101399	February 16, 2010
3GPP TS 36.211 v12.2.0	July 3, 2014
3GPP TS 36.300 v12.2.0	July 4, 2014
3GPP TS 36.213 v12.2.0	July 3, 2014
3GPP TS 36.331 v12.2.0	July 4, 2014
3GPP TS 36.133 v11.9.0	July 4, 2014
3GPP TR 36.828 v11.0.0	June 26, 2012
3GPP TR 21.900 v11.0.1	June 24, 2013
3GPP TR 21.905 v12.0.0	June 25, 2013
3GPP TS 36.214 v11.1.0	December 20, 2012
3GPP TS 36.302 v12.0.0	July 2, 2014
3GPP TS 36.321 v12.2.0	July 2, 2014

3GPP TS 36.211 v12.1.0	March 21, 2014
3GPP TS 36.300 v12.1.0	March 19, 2014
3GPP TS 36.213 v12.1.0	March 21, 2014
3GPP TS 36.331 v12.1.0	March 19, 2014
3GPP TS 36.133 v11.8.0	March 27, 2014
3GPP TR 36.828 v2.0.0	June 15, 2012
3GPP TS 23.401 v10.3.0	March 2011
3GPP TS 24.301 v10.2.0	March 2011
3GPP TS 25.413 v10.1.0	March 2011
3GPP TS 36.211 v10.1.0	March 2011
3GPP TS 36.213 v10.1.0	March 2011
3GPP TS 36.300 v10.3.0	March 2011
3GPP TS 36.302 v10.1.0	March 2011
3GPP TS 36.306 v10.1.0	March 2011
3GPP TS 36.321 v10.1.0	March 2011
3GPP TS 36.331 v10.1.0	March 2011
3GPP TS 36.413 v10.1.0	March 2011
Armin Dammann et al., Beamforming in Combination with Space-Time Diversity for Broadband OFDM Systems, 2002 IEEE ICC	April 2002
ETSI TS 136.213 v10.1.0	April 2011
ETSI TS 134.123-1 v9.3.0	April 2011
Klaus I. Pedersen, Directional Power-Based Admission Control for WCDMA Systems Using Beamforming Antenna Array Systems, IEEE Transactions on Vehicular Tech.	November 2002

Klaus I. Pedersen, Application and Performance of Downlink Beamforming Techniques in UMTS	October 2003
ETSI TS 123.401 V9.8.0	March 2011
ETSI TS 143.129 V10.0.0	April 2011
Adaptive Handoff Algorithm for Multi-beam GEO Mobile Satellite System by Li Song, Ai-Jun Liu, and Yi-Fei Ma; 2008 IEEE International Conference on Communications	May 2008
Dynamic Resource Allocation Schemes During Handoff for Mobile Multimedia Wireless Networks, by Parameswaran Ramanathan, Krishna M. Sivalingam, Prathima Agrawal, and Shalinee Kishore; IEEE Journal on Selected Areas in Communications	July 1999
3GPP TS 23.401 v10.3.0	March 28, 2011
3GPP TS 23.401 v10.2.0	December 20, 2010
3GPP TS 36.331 v.10.0.0	December 21, 2010
3GPP TS 36.211 v.10.1.0	March 30, 2011
3GPP TS 36.211 v10.0.0	December 21, 2010
3GPP TS 36.213 v10.0.0	December 22, 2010
3GPP TS 36.214 v10.0.0	December 22, 2010
3GPP TS 36.321 v10.1.0	April 6, 2011
3GPP TS 36.321 v10.0.0	December 21, 2010
3GPP TS 36.306 v10.1.0	April 5, 2011
3GPP TS 36.306 v10.0.0	December 21, 2010
3GPP TS 36.302 v10.1.0	March 28, 2011
3GPP TS 36.413 v10.1.0	April 5, 2011
3GPP TS 24.301 v10.2.0	April 3, 2011
3GPP TS 25.413 v10.1.0	April 4, 2011
3GPP TR 21.900 v11.0.1	June 2013

3GPP TR 21.905 v12.0.0	June 2013
3GPP TS 36.133 v11.9.0	July 2014
3GPP TS 36.211 v12.2.0	Jun 2014
3GPP TS 36.213 v12.2.0	June 2014
3GPP TS 36.214 v11.1.0	December 2012
3GPP TS 36.300 v12.2.0	June 2014
3GPP TS 36.302 v12.0.0	June 2014
3GPP TS 36.321 v12.2.0	June 2014
3GPP TS 36.331 v12.2.0	June 2014
3GPP TS 36.828 v11.0.0	June 2012
R1-135639	November 2013
Vinodhini Ravikumar, Fair and optimal resource allocation in wireless sensor networks	Spring 2014
Fernando Sanchez-Moya, On the Impact of Explicit Uplink Information on Autonomous Component Carrier Selection for LTE-A Femtocells, IEEE VTS Vehicular Tech Conference	2011
Mehdi Ghamari et al., Optimal and sub-optimal resource allocation in multiple-input multiple-output-orthogonal frequency division multiplexing-based multi-relay cooperative cognitive radio networks	November 20, 2013
Shrawan C. Surender, Design and Analysis of Ultra-Wideband Ad Hoc Covert Wireless Radar-Comm Networks	2011
Musbah Shaat et al., Low Complexity Power Loading Scheme in Cognitive Radio Networks FBMC Capability	September 2009
3GPP TR 36.828 V11.0.0, Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Further enhancements to LTE Time Division Duplex (TDD) for Downlink-Uplink (DL-UL) interference management and traffic adaptation (Release 11)	June 26, 2012
REV-090003r1, LTE-Advanced Physical Layer, Matthew Baker (Alcatel-Lucent), IMT-Advanced Evaluation Workshop 17-18 December 2009, Beijing	December 17, 2009
LTE for UMTS OFDMA and SC-FDMA Based Radio Access by Holma & Toskala (“Holma and Toskala (2009)”)	2009

WCDMA for UMTS by Holma and Toskala ("Holma and Toskala (2004)")	2004
LTE for UMTS: Evolution to LTE-Advanced Second Edition ("Holma and Toskala (2011))"	March 2011
Wong, S. & Wassell, I., Dynamic Allocation Using a Genetic Algorithm for a TDD Broadband Fixed Wireless Access Network, Laboratory for Communications Engineering (2002) ("Wong")	July 17, 2002
Cooper, W. et al., Modeling dynamic channel-allocation algorithms in multi-BS TDD wireless networks with Internet- based traffic, IEEE Transactions on Vehicular Technology, Vol. 53, No. 3 (May 1, 2004) ("Cooper")	May 1, 2004
Jeong, W. & Kavehrad, M., Cochanel Interference Reduction in Dynamic-TDD Fixed Wireless Applications, Using Time Slot Allocation Algorithms, IEEE Transactions on Communications, Vol. 50, No. 10 (October 2002) ("Jeong")	October 2002
A. Roessler, J. at al., LTE-Advanced (3GPP Rel. 12) Technology Introduction White Paper, Rohde & Shwarz (June 2014) ("Roessler")	June 2014
Draft Minutes Report RAN#77 v020	July 24, 2014
R1-142772, CR 0158 to TS 36.212, Introduction of Rel 12 features of TDD-FDD CA and eIMTA, 3GPP TSG-RAN WG1 Meeting #77, Huawei (May 19-23, 2014) ("R1-142772")	June 3, 2014
R1-142771, CR 0191 to TS 36.211, Inclusion of eIMTA, TDD-FDD CA, and coverage enhancements, 3GPP TSG-RAN WG1 Meeting #77, Ericsson (May 19-23, 2013) ("R1-142771")	June 3, 2014
R1-130015, Interference mitigation schemes for TDD eIMTA, 3GPP TSG RAN WG1 Meeting #72, Huawei & HiSilicon (January 28-February 1, 2013) ("R1-130015")	January 19, 2013
R1-133580, CSI measurement for eIMTA, 3GPP TSG RAN WG1 Meeting #74, Qualcomm Incorporated (August 19-23, 2013) ("R1-133580")	August 10, 2013
R1-141949, CSI measurement and reporting in eIMTA, 3GPP TSG RAN WG1 Meeting #77, Qualcomm Incorporated (May 19-23, 2014) ("R1-141949")	May 10, 2014
R1-112122, Traffic adaptation evaluation methodologies and assumptions for LTE TDD eIMTA, 3GPP TSG RAN WG1 Meeting #66, CATT (August 22-26, 2011) ("R1-112122")	August 16, 2011
RP-110450, New study item proposal for Further Enhancements to LTE TDD for DL-UL Interface Management and Traffic Adaptation, 3GPP TSG-RAN Meeting #51, Ericsson, CATT, ST-Ericsson (March 15-18, 2010) ("RP- 110450")	April 3, 2011
RP-110855, Report of 3GPP TSG RAN Meeting #51, ETSI MCC (March 15-18, 2011) ("RP-110855")	June 10, 2011

R1-132296, On CSI measurements for eIMTA, 3GPP TSG- RAN WG1 Meeting #73, Nokia Siemens Networks, Nokia (May 20-24, 2013) ("R1-132296")	May 11, 2013
R1-135639, Remaining details of CSI enhancements for eIMTA, 3GPP TSG-RAN WG1 Meeting #75, Ericsson (November 11-15, 2013) ("R1-135639")	November 1, 2014
Nokia demonstrating 3.8 Gbps TDD-FDD LTE throughput, Mobile Asia Expo June 2014, https://www.youtube.com/watch?v=hjdkOmfbQM8 ("Nokia TDD-FDD carrier aggregation video")	June 1, 2014
Analysis of Effects of Clipping and Filtering on the Performance of MB-OFDM UWB Signals by K. Deergha Rao ("Rao")	2007
IEEE 802.11n Draft 2.0 ("802.11n D2.0")	March 2007
IEEE Standard 802.11-2007 ("802.11-2007")	June 2007

Moreover, the prior art non-patent publications listed on the face of the Asserted Patents discloses (i.e., anticipates and/or renders obvious) the elements of the Asserted Claims either explicitly or inherently, and Samsung reserves the right to rely on any such reference.

D. Prior Art Systems and/or Knowledge

The Asserted Claims are invalid under 35 U.S.C. §§ 102 and/or 103 based on prior art items offered for sale or publicly used or known or prior inventions, such as prior art products, including systems embodying any alleged inventions or structures described in, and/or any knowledge disclosed by or referred to in, any of the prior art patents or prior art publications identified above in Sections III.B and III.C. Because Samsung has not yet completed discovery in this case, Samsung reserves the right to supplement theses Contentions with facts, documents, or other information learned at a later point through third-party discovery or further investigation. For example, Samsung expects to receive documents from additional third parties either through informal requests or under subpoenas that are believed to have knowledge, documentation, and/or corroborating evidence concerning some of the prior art listed above and below and/or additional

prior art. These third parties include without limitation the authors, inventors, or assignees of the references listed in these Contentions. In addition, Samsung reserves the right to assert invalidity under other sections of 35 U.S.C. § 102 to the extent that discovery or further investigation yield information forming the basis for such invalidity.

Moreover, all of the systems and products listed below qualify as prior art to each of the Asserted Patents under at least pre-AIA 35 U.S.C. §§ 102(a)/(b). Such systems and products were known, used, offered for sale, and/or sold in the United States prior to the appropriate priority date corresponding to each of the Asserted Patents.

Applications/Services/APIs
DroidWall
Auto Update
Amazon Music
NYTime App
SlingPlayer

User Equipment
iPhone 4
HTC Desire
BlackBerry Bold 9700
Nokia N8
Motorola Droid X
Sony Ericsson Xperia X10
LG Optimus One
HTC Evo 4G

Base Stations
Nokia Base Stations
Ericsson Base Stations

Servers
Servers supporting any of the above-identified Applications/Services/APIs

The Federal Circuit has held that "[t]he proper test for the public use prong of the [pre-AIA] § 102(b) statutory bar is whether the purported use: (1) was accessible to the public; or (2) was commercially exploited." *See Invitrogen Corp. v. Biocrest Mfg. L.P.,* 424 F.3d 1374, 1380 (Fed. Cir. 2005). Additionally, the on-sale bar of § 102(b) is triggered when the invention is both (1) the subject of a commercial offer for sale not primarily for experimental purposes and (2) ready for patenting. *Pfaff v. Wells Elecs., Inc.*, 525 U.S. 55, 67 (1998). Each of the systems and products listed above meets these criteria.

The above discussion is not exclusive. Samsung reserves the right to rely on both the listed products as well as other products that may become known and/or relevant during the course of this matter.

Any citation to one or more of these prior art references, or other prior art references regarding any method or system, should be construed to constitute not only a citation to the prior art reference itself but also a reference to the system itself. Discovery is ongoing in this case, and Samsung will supplement these Contentions if and when more information becomes available. For example, Defendants are already in the process of taking discovery from non-parties including Nokia, BlackBerry, Google, Apple, Openwave, and Microsoft. Accordingly, Defendants reserve the right to modify, amend, and/or supplement these contentions as information becomes available from non-parties.

E. Prior Art Under 35 U.S.C. §§ 102(f) and 102(g)

Each prior art patent, publication, or product identified above was either effectively filed or issued (for patents), published (for publications) or known, used, offered for sale or sold (for products) before the earliest claimed priority date of the Asserted Patents to which it is applied for

invalidity, and none was abandoned, suppressed, or concealed, so each such reference also constitutes evidence of prior invention pursuant to 35 U.S.C. § 102(g), if it is in the U.S. The persons or entities involved with each such invention include the named inventors on the above-identified patents, the authors listed on the above-identified publications, and the entities and individuals identified in connection with the above-identified products.

Because Samsung has not yet completed discovery in this case, including taking depositions of the named inventors of the Asserted Patents, reviewing Cobblestone's productions, and seeking discovery of prior inventions by third parties, Samsung reserves the right to supplement these Contentions with facts, documents, or other information learned at a later point through discovery or further investigation.

IV. ANTICIPATION AND OBVIOUSNESS (35 U.S.C. §§ 102 AND 103)

The Asserted Claims are anticipated by and/or rendered obvious in view of one or more items of prior art identified in these Contentions, alone and/or in combination. Based on its investigation to date, Samsung has provided in the lists above the prior art presently known to Samsung that anticipates and/or renders obvious the Asserted Claims under at least Cobblestone's actual and/or apparent application of those claims. The prior art identified in these Contentions discloses (i.e., anticipates and/or renders obvious) the elements of the Asserted Claims either explicitly or inherently.

Prior art patents or publications included in these Contentions may be related (such as a divisional, continuation, continuation-in-part, parent, or child) to earlier or later-filed patents or publications, may have counterparts filed in other jurisdictions, or may incorporate (or be incorporated by) other patents or publications by reference. The listed patents or publications are

intended to be representative of these other patents or publications to the extent they exist. Samsung accordingly reserves the right to modify, amend, or supplement these Contentions with these related patents or publications, as well as other prior art references, upon further investigation. Additionally, any reference in these Contentions, including the appendices and/or exhibits thereto, to a specific subsection or subsections of 35 U.S.C. § 102, is merely exemplary, and Samsung expressly reserves the right to rely on additional or other sections of 35 U.S.C. § 102, as appropriate.

Although Samsung's investigation is ongoing, information available to date indicates that each prior art system disclosed above was at least (1) known or used in this country before the alleged invention of the claimed subject matter of the Asserted Patents; (2) in public use, on sale, or offered for sale in this country more than one year before the effective filing date for the Asserted Patents; or (3) invented and not abandoned, suppressed, or concealed prior to the alleged invention of the Asserted Patents.

Much of the art identified in these Contentions reflects common knowledge and the state of the art prior to the filing or asserted priority dates of the Asserted Patents. As such, the obviousness combinations in these Contentions are intended to be exemplary. There are many possible combinations of the disclosed prior art, and the inclusion of certain exemplary combinations does not exclude other combinations. For example, where a particular contention calls for combining references, any of a number of references can be combined.

Depending on the construction of the claims of the Asserted Patents, and/or positions that Cobblestone or its expert witnesses may take concerning claim interpretation, infringement, and/or invalidity issues, different ones of the charted prior art references in the Exhibits may be of greater

or lesser relevance and different combinations of these references may be implicated. Given the uncertainty, the charts may reflect alternative applications of the prior art against the Asserted Claims.

Citations to particular excerpts from the prior art are likewise exemplary and not exhaustive of the evidentiary support for the invalidity of the Asserted Patents contained in and/or concerning a particular piece of prior art. Samsung may rely on uncited portions of the prior art references, other documents or operational systems, the "Background of the Invention" and other relevant portions of the Asserted Patents, the prosecution histories of the Asserted Patents (including all cited references) and their related patents and applications, and forthcoming fact and expert testimony to provide context to aid in understanding the prior art reference and/or the cited portions of the references. Where Samsung cites to a particular figure in a reference, the citation encompasses the caption and description of the figure and any text relating to or discussing the figure. Likewise, where Samsung cites text referring to a figure, the citation includes the figure as well (and vice versa).

A. Prior Art Under 35 U.S.C. § 102

Samsung contends that at least the primary prior art references (Exs. A-01 through E-13) identified below, by themselves, anticipate one or more of the Asserted Claims:

Exhibits	Primary References and/or Systems
A-1	Long Distance HF Communications based on OFDM Pilot Symbols, COMMUNICATIONS AND SIGNAL THEORY, by R. Aquilué et al. ("Aquilué")
A-2	U.S. Patent No. 7,162,218 ("Axness")
A-3	U.S. Patent Application Publication No. 2006/0212773 ("Aytur")
A-4	U.S. Patent Application Publication No. 2005/0249266 ("Brown-266")
A-5	U.S. Patent No. 8,036,702 ("Etemad")
A-6	U.S. Patent Application Publication No. 2009/0052556 ("Fernandez")

A-7	*Equipment for On-Board Processing Payloads – Developments in the Frame of the ESA OBP Program*, 2000 AMERICAN INSTITUTE OF AERONAUTICS & ASTRONAUTICS by G. Garofalo et al. ("Garofalo")
A-8	U.S. Patent No. 6,876,645 ("Guey")
A-9	U.S. Patent No. 6,920,185 ("Hinson")
A-10	*Linearization of Multi-Carrier Power Amplifiers*, IEEE, by Mats Johansson et al.("Johansson")
A-11	U.S. Patent Application Publication No. 2006/0233147 ("Karabinis")
A-12	U.S. Patent No. 6,529,715 ("Kitko")
A-13	WIPO Patent Application Publication No. 2005/109917 ("Laroia")
A-14	U.S. Patent No. 8,204,452 ("Lin")
A-15	U.S. Patent Application Publication No. 2005/0135312 ("Montojo")
A-16	U.S. Patent No. 7,885,344 ("Nakayama")
A-17	U.S. Patent Application Publication No. 2006/0276146 ("Suzuki")
A-18	*Effects of Nonlinear Distortion on Switched Multibeam FDMA Systems*, IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION, Volume 51, No. 3 by Mattias Wennström et al. ("Wennström")
A-19	Prior art Nokia and Ericsson base station equipment
A-20	U.S. Patent No. 7,742,388 ("Shearer")
A-21	U.S. Patent No. 6,516,206 ("Jäntti")
A-22	*Analysis of Effects of Clipping and Filtering on the Performance of MB-OFDM UWB Signals* by K. Deergha Rao ("Rao")
A-23	U.S. Patent Application Publication No. 2007/0081613 ("Kim-613")
A-24	U.S. Patent Application Publication No. 2005/0237923 ("Balakrishnan")
A-25	U.S. Patent No. 8,416,879 ("Rofougaran")
A-26	U.S. Patent Application Publication No. 2010/0062726 ("Zheng")
A-27	U.S. Patent No. 8,693,525 ("Rick")
A-28	U.S. Patent No. 6,952,454 ("Jalali")
A-29	U.S. Patent No. 6,359,868 ("Chen-868")
A-30	IEEE 802.11n Draft 2.0 ("802.11n D2.0")
A-31	IEEE Standard 802.11-2007 ("802.11-2007")
B-1	U.S. Patent No. 9,161,360 ("Banu")
B-2	U.S. Patent Pub. No. 2005/0261028 ("Chitrapu-028")
B-3	U.S. Patent No. 8,285,291 ("Dinan")
B-4	U.S. Patent No. 8,229,506 ("Duet")
B-5	U.S. Patent No. 5,615,409 ("Forssen")
B-6	U.S. Patent No. 8,842,525 ("Kim")
B-7	U.S. Pat. App. Pub. No. 2004/0162115 A1 ("Smith")
B-8	U.S. Patent No. 8,548,525 ("Wong")
B-9	Prior art Nokia and Ericsson base station equipment
C-1	3GPP Standards
C-2	U.S. Patent Application No. US 2006/0210070 or U.S. Pat. No. 7,688,979 to Reznik et al. ("Reznik").

C-3	U.S. Patent Application US 2003/0153360 or U.S. Pat. No. 7,046,978 to Burke et al. ("Burke").
C-4	U.S. Patent Application No. US 2010/0215113 or U.S. Pat. No. 8,509,334 to Lindgren et al. ("Lindgren ").
C-5	U.S. Patent Application No. US 2006/0286974 to Gore et al. ("Gore")
C-6	Sesia et al., LTE: The UMTS Long Term Evolution From Theory to Practice ("Sesia")
C-7	U.S. Patent No. 8,654,815 to Forenza et al.
C-8	Prior art Nokia and Ericsson base station equipment
D-1	3GPP Standards
D-2	U.S. Patent Publication No. 2006/0111149 ("Chitrapu-149")
D-3	U.S. Patent Publication No. 2009/0298502 ("Hagerman-502")
D-4	*LTE for UMTS: Evolution to LTE-Advanced*, 2d Ed., Edited by Holma, H. and Toskala, A. (2011) ("Holma Toskala Textbook")
D-5	U.S. Patent Application No. 2008/0181180 ("Karaogus")
D-6	U.S. Patent No. 7,289,826 ("Hovers")
D-7	Chinese Patent No. CN 101917747 ("Huawei")
D-8	U.S. Patent Application No. 2010/0113002A1 ("Joko")
D-9	U.S. Patent Publication No. 2010/0099416A1 ("Kazmi")
D-10	U.S. Patent Publication No. 2004/0176094 ("Kim-094")
D-11	WO 2009/079316 ("Motorola")
D-12	U.S. Patent Application No. 2010/0291931A ("Suemitsu")
D-13	U.S. Patent Publication No. 2005/0073977 ("Vanghi-977")
D-14	Prior art Nokia and Ericsson base station equipment
E-1	3GPP Standards
E-2	U.S. Patent Pub. No. 2010/0124181 ("Hosein")
E-3	U.S. Patent No. 8,295,779 ("Cave")
E-4	U.S. Patent No. 8,576,738 ("Chen")
E-5	U.S. Patent Pub. No. 2014/0341051 ("Gaal-051")
E-6	International Patent Publication No. WO 2009/050649 ("Ho-649")
E-7	U.S. Patent No. 9,185,620 ("Khoryaev")
E-8[5]	U.S. Patent Pub. No. 2017/0055257 A1 ("Nanchang")
E-9	R1-132296, *On CSI measurements for eIMTA*, 3GPP TSG-RAN WG1 Meeting #73, Nokia Siemens Networks, Nokia (May 20-24, 2013) ("R1-132296")

[5] Exhibit E-8 contains a chart for the same primary prior art reference—U.S. Patent Pub. No. 2017/0055257—as Exhibit E-12. All disclosures and invalidity mapping disclosed and identified in Exhibit E-8 are incorporated by reference into Exhibit E-12 as if set forth fully therein. Samsung is disclosing, and reserves the right to rely on, all invalidity disclosures presented in both Exhibit E-8 and Exhibit E-12 for U.S. Patent Pub. No. 2017/0055257 against the '361 patent, and the inclusion of Exhibit E-8 and Exhibit E-12 is not a limit on any such disclosure.

E-10	R1-135639, Remaining Details of CSI enhancement for eIMTA, 3GPP TSG-RAN WG1 Meeting #75, Ericsson (November 11-15, 2013) ("R1-135639")
E-11	U.S. Patent Pub. No. 2010/0034157 ("Stolyar-157")
E-12	U.S. Patent Pub. No. 2017/0055257 ("Zhang-257")
E-13	Prior art Nokia and Ericsson base station equipment

Specifically, Samsung contends that at least the references and/or systems in the table above independently anticipate the Asserted Claims under 35 U.S.C. §§ 102(a), (b), (e), (f), and/or (g), as set forth in the charts attached as:

- Exhibits A-01 through Exhibits A-31 for the asserted claims of the '802 patent;
- Exhibits B-01 through Exhibits B-9 for the asserted claims of the '196 patent;
- Exhibits C-01 through Exhibits C-08 for the asserted claims of the '347 patent;
- Exhibits D-01 through Exhibits D-14 for the asserted claims of the '888 patent;
- Exhibits E-01 through Exhibits E-13 for the asserted claims of the '361 patent.

Samsung's claim charts provide exemplary citations to the prior art references that teach or suggest every element of each of the Asserted Claims of the Asserted Patent. To the extent that an element of an Asserted Claim is not shown in a chart, the Asserted Claims would have been obvious based on a combination of one or more other prior art references, as set forth below and in Exhibits A-E.

Where an asserted prior art reference in any attached claim charts relies on a claim of priority to assert a critical reference date under pre-AIA 35 U.S.C. § 102 *et seq*. (including pre-AIA § 102(e)), compliance with pre-AIA 35 U.S.C. § 112, first paragraph, or 35 U.S.C. § 112(a), is shown in an appendix to a given claim.

These charts, however, are exemplary. The claimed features are similarly described and suggested in other places (including in all of the documents cited during prosecution of each piece

of prior art), and also were present when prior-art systems practicing the described prior art were used before the application that ultimately led to the Asserted Patents. Thus, where patents or other printed materials are disclosed, Samsung reserves the right to also rely on those materials as descriptions of systems, devices, or methods referenced therein, publicly used, and/or on sale or known in the United States. Further, Samsung reserves the right to rely on other evidence of the prior art beyond merely the exemplary references cited in the charts attached as Exhibits.

Where patents or other printed materials are disclosed, Samsung reserves the right to also rely on those materials as descriptions of systems, devices, or methods referenced therein, publicly used, and/or on sale or known in the United States. Samsung reserves the right to also use those references to invalidate the claim under 35 U.S.C. § 103.

B. Prior Art Under 35 U.S.C. § 103

To the extent that a primary reference is deemed, by itself, not to anticipate or render obvious a claim for failing to teach one or more limitations, the claim would nonetheless have been obvious to a POSITA at the time of the invention by the combination of the primary reference with one or more other primary references and/or the knowledge of someone skilled in the art.

Moreover, First Supplemental Exhibit A-Obviousness[6], and Exhibits B-Obviousness, C-Obviousness, D-Obviousness, E-Obviousness list secondary prior art references and identify, on limitation-by-limitation bases, exemplary disclosures where each secondary reference teaches the limitations of the asserted claims. To the extent that a primary reference is deemed, by itself, not

[6] Samsung supplements Exhibit A-Obviousness that was served along with Samsung's December 27, 2023 Invalidity Contentions with the First Supplemental Exhibit A-Obviousness served concurrently with this First Supplemental Preliminary Invalidity Contentions. All references to Exhibit A-Obviousness in Samsung's December 27, 2023 cover pleading and charts are hereby amended to refer to First Supplemental Exhibit A-Obviousness.

to anticipate or render obvious a claim for failing to teach one or more limitations, the claim would nonetheless have been obvious to a POSITA at the time of the invention by the additional combination of the primary reference with one or more of the references listed as disclosing those alleged missing limitations in First Supplemental Exhibit A-Obviousness, and Exhibits B-Obviousness, C-Obviousness, D-Obviousness, E-Obviousness. To the extent that an element of an Asserted Claim is not shown in a chart, the Asserted Claims would have been obvious based on a combination of one or more other prior art references, as set forth below and in Appendices A-E.

As such, a POSITA would have been motivated to combine any reference set forth in at least the following charts:

- Exhibit A-01 through Exhibit A-31 and First Supplemental Exhibit A-Obviousness for the asserted claims of the '802 patent;
- Exhibit B-01 through Exhibit B-9 and Exhibit B-Obviousness for the asserted claims of the '196 patent;
- Exhibit C-01 through Exhibit C-8 and Exhibit C-Obviousness for the asserted claims of the '347 patent; and
- Exhibit D-01 through Exhibit D-14 and Exhibit D-Obviousness for the asserted claims of the '888 patent;
- Exhibit E-01 through Exhibit E-13 and Exhibit E-Obviousness for the asserted claims of the '361 patent.

Such combinations would be achieved, for example, by merely combining the disclosures described in the respective claim charts for each reference.

These charts, however, are exemplary. The claimed features are similarly described and suggested in other places (including in all of the documents cited during prosecution of each piece of prior art), and also were present when prior-art systems practicing the described prior art were used before the application that ultimately led to the Asserted Patents. Where patents or other

printed materials are disclosed, Samsung reserves the right to also rely on those materials as descriptions of systems, devices, or methods referenced therein, publicly used, and/or on sale or known in the United States. Further, Samsung reserves the right to rely on other evidence of the prior art beyond merely the exemplary references cited in the charts attached as Exhibits.

Samsung's assertion that the combinations above render the asserted claims obvious under 35 U.S.C. § 103 is not, and is not intended to be, an admission or suggestion that each reference does not independently anticipate the Asserted Claims under 35 U.S.C. § 102. *See Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 1548 (Fed. Cir. 1983) ("'[A]nticipation is the epitome of obviousness.'") (quoting *In re Fracalossi*, 681 F.2d 792, 794 (CCPA 1982)). Further, the fact that certain secondary references are listed solely in First Supplemental Exhibit A-Obviousness, and Exhibits B-Obviousness, C-Obviousness, D-Obviousness, E-Obviousness is not intended to be an admission or suggestion that each individual reference cited therein does not also independently anticipate and/or render obvious the Asserted Claims under 35 U.S.C. §§ 102 and 103. Samsung expressly reserves the right to rely on any secondary reference cited in First Supplemental Exhibits A-Obviousness, and Exhibits B-Obviousness, C-Obviousness, D-Obviousness, E-Obviousness as if it were set forth as a primary reference in Section IV.A, *supra*. Finally, the inclusion of the exemplary combinations in the attached Exhibits and Appendices does not exclude other combinations of prior art disclosed in this or previous sections.

C. Exemplary Combinations

Exemplary combinations of prior art references that render the Asserted Claims invalid as obvious under 35 U.S.C. § 103 are described in:

- First Supplemental Exhibit A-Obviousness for the asserted claims of the '802 patent;

- Exhibit B-Obviousness for the asserted claims of the ’196 patent;
- Exhibit C-Obviousness for the asserted claims of the ’347 patent;
- Exhibit D-Obviousness for the asserted claims of the ’888 patent;
- Exhibit E-Obviousness for the asserted claims of the ’361 patent.

Moreover, each prior art reference or system may be combined with (1) information known to persons skilled in the art at the time of the alleged invention; (2) any other anticipatory prior art references or systems; and (3) any of the additional prior art identified above or in the prosecution of the Asserted Patents and related applications.

Below are examples of prior art references and/or systems that would have been combined by one of ordinary skill in the art at the time of the alleged invention. These combinations are merely examples.

1. ’802 Patent

The Asserted Claims of the ’802 patent are rendered obvious by:

- Suzuki alone or in combination with one or more of the references identified in Exhibits A1-A19;
- Suzuki and Brown together or in combination with one or more of the references identified in Exhibits A1-A19;
- Fernandez alone or in combination with one or more of the references identified in Exhibits A1-A19;
- Montojo alone or in combination with one or more of the references identified in Exhibits A1-A19;
- Brown alone or in combination with one or more of the references identified in Exhibits A1-A19;
- Any combination of one or more of the references and/or systems identified in First Supplemental Exhibit A-Obviousness.

2. ’196 Patent

- Banu alone or in combination with one or more of the references identified in Exhibits B1-B9;
- Chitrapu-028 alone or in combination with one or more of the references identified in Exhibits B1-B9;
- Dinan alone or in combination with one or more of the references identified in Exhibits B1-B9;
- Duet alone or in combination with one or more of the references identified in Exhibits B1-B9;
- Forssen alone or in combination with one or more of the references identified in Exhibits B1-B9;
- Kim alone or in combination with one or more of the references identified in Exhibits B1-B9;
- Smith alone or in combination with one or more of the references identified in Exhibits B1-B9;
- Wong alone or in combination with one or more of the references identified in Exhibits B1-B9;
- Wong and Dinan together or in combination with one or more of the references identified in Exhibits B1-B9;
- Chitrapu-028 and Wong together or in combination with one or more of the references identified in Exhibits B1-B9;
- Any combination of one or more of the references and/or systems identified in Exhibit B-Obviousness.

3. '347 Patent

- 3GPP TS 36.211 v10.2.0 in combination with any of 3GPP TS 36.211 v10.1.0, 3GPP TS 36.212 v10.2.0, 3GPP TS 36.212 v10.1.0, 3GPP TS 36.213 v10.2.0 , 3GPP TS 36.213 v10.1.0, 3GPP TS 36.101 v10.3.0, 3GPP TS 36.101 v10.2.1, 3GPP TS 36.300 v10.4.0, 3GPP TS 36.300 v10.3.0, 3GPP TS 36.300 v10.2.0, 3GPP TS 36.133 v 10.3.0, 3GPP TS 36.133 v10.2.0, 3GPP TS 36.133 v10.1.0, 3GPP TS 36.331 v.10.2.0 , 3GPP TS 36.331 v10.1.0, 3GPP TR 21.900 v10.0.0, 3GPP TR 21.905 v10.3.0, 3GPP TS 36.214 v10.1.0, 3GPP TS 36.302 v10.2.0, 3GPP TS 36.321 v10.2.0, 3GPP TR 25.913 v9.0.0 (the "3GPP Standards") together or in combination with one or more of the references identified in Exs. C1-C8;

- 3GPP standards ("3GPP Standards") in combination with Sesia and/or 7,738,925 and/or any of the 3GPP contributions R1-101711 at § 7.2.4; see also R1-100889, R1-100926, R1-101429, R1-101465, R1-101488, R1-101217, R1-101129, R1- 101162, R1-101218, R1-100852, R1-100927, R1-101625, R1-101683, R1-101061, R1-101382, R1-101399 in further view of TR-1101, Someya & Ohtsuki, Gini, or Dahlman & Parkvall and/or Holma & Toskala together or in combination with one or more of the references identified in Exs. C1-C8;

- Sesia in combination with any of the 3GPP contributions R1-101711 at § 7.2.4; see also R1-100889, R1-100926, R1-101429, R1-101465, R1-101488, R1-101217, R1- 101129, R1-101162, R1-101218, R1-100852, R1-100927, R1-101625, R1-101683, R1-101061, R1-101382, R1-101399 in further view of TR-1101, Someya & Ohtsuki, Gini, or Dahlman & Parkvall and/or Holma & Toskala together or in combination with one or more of the references identified in Exs. C1-C8;

- U.S. Patent Application No. US 2006/0210070 to Reznik et al. ("Reznik") in further view of Sesia, TR-1101, Someya & Ohtsuki, Gini, or Dahlman & Parkvall and/or Holma & Toskala together or in combination with one or more of the references identified in Exs. C1-C8;

- U.S. Patent Application US 2003/0153360 to Burke et al. ("Burke") in further view of Sesia TR-1101, Someya & Ohtsuki, Gini, or Dahlman & Parkvall and/or Holma & Toskala together or in combination with one or more of the references identified in Exs. C1-C8;

- U.S. Patent Application No. US 2010/0215113 to Lindgren et al. ("Lindgren") in further view of Sesia, TR-1101, Someya & Ohtsuki, Gini, or Dahlman & Parkvall and/or Holma & Toskala together or in combination with one or more of the references identified in Exs. C1-C8;

- U.S. Patent Application No. US 2006/0286974 to Gore et al. ("Gore") in further view of Sesia, TR-1101, Someya & Ohtsuki, Gini, or Dahlman & Parkvall and/or Holma & Toskala together or in combination with one or more of the references identified in Exhibits C1-C8;

- Sesia et al., LTE: The UMTS Long Term Evolution From Theory To Practice ("Sesia") in further view of TR-1101, Someya & Ohtsuki, Gini, or Dahlman & Parkvall and/or Holma & Toskala together or in combination with one or more of the references identified in Exs. C1-C8;

- Any combination of one or more of the references and/or systems identified in Exhibit C-Obviousness.

4. '888 Patent

- 3GPP TS 36.300 v10.3.0 in combination with 3GPP TS 23.401 v10.3.0 and/or 3GPP TS 36.331 v10.1.0 and/or 3GPP TS 36.211 v10.1.0 and/or 3GPP TS 36.213 v10.1.0 and/or 3GPP TS 36.214 v10.1.0 and/or 3GPP TS 36.321 v10.1.0 and/or 3GPP TS 36.306 v10.1.0 (collectively "3GPP Standards") together or in combination with one or more of the references identified in Exhibits D1-D14;

- 3GPP Standards in combination with U.S. Patent Publication No. 2006/0111149A1 ("Chitrapu-149") together or in combination with one or more of the references identified in Exhibits D1-D14;

- 3GPP Standards in combination with LTE for UMTS: Evolution to LTE- Advanced, 2d Ed., Edited by Holma, H. and Toskala, A. (2011) ("Holma") or LTE for UMTS OFDMA and SC-FDMA Based Radio Access by Holma & Toskala ("Holma & Toskala (2009)") together or in combination with one or more of the references identified in Exhibits D1-D14;

- 3GPP Standards in combination with U.S. Patent Publication No. 2006/0111149A1("Chitrapu-149") together or in combination with one or more of the references identified in Exhibits D1-D14;

- 3GPP Standards in combination with U.S. Patent Publication No. 2004/0176094 ("Kim-094") together or in combination with one or more of the references identified in Exhibits D1-D14;

- 3GPP Standards in combination with U.S. Patent Publication No. 2009/0298502 ("Hagerman-502") together or in combination with one or more of the references identified in Exhibits D1-D14;

- 3GPP Standards in combination with U.S. Patent Publication No. 2005/0073977 ("Vanghi-977") together or in combination with one or more of the references identified in Exhibits D1-D14;

- U.S. Patent Publication No. 2006/0111149A1("Chitrapu-149") in combination with U.S. Patent Publication No. 2009/0298502 ("Hagerman-502") together or in combination with one or more of the references identified in Exhibits D1-D14;

- U.S. Patent Publication No. 2006/0111149A1("Chitrapu-149") in combination with LTE for UMTS: Evolution to LTE-Advanced, 2d Ed., Edited by Holma, H. and Toskala, A. (2011) ("Holma") or LTE for UMTS OFDMA and SC-FDMA Based Radio Access by Holma & Toskala ("Holma & Toskala (2009)") together or in combination with one or more of the references identified in Exhibits D1-D14;

- U.S. Patent Publication No. 2006/0111149A1("Chitrapu-149") in combination with U.S. Patent Publication No. 2004/0176094 ("Kim-094") together or in combination with one or more of the references identified in Exhibits D1-D14;

- U.S. Patent Publication No. 2006/0111149A1("Chitrapu-149") in combination with U.S. Patent Publication No. 2005/0073977 ("Vanghi-977") together or in combination with one or more of the references identified in Exhibits D1-D14;

- U.S. Patent Publication No. 2009/0298502 ("Hagerman-502") in combination with LTE for UMTS: Evolution to LTE-Advanced, 2d Ed., Edited by Holma, H. and Toskala, A. (2011) ("Holma") or LTE for UMTS OFDMA and SC-FDMA Based Radio Access by Holma & Toskala ("Holma & Toskala (2009)") together or in combination with one or more of the references identified in Exhibits D1-D14;

- U.S. Patent Publication No. 2009/0298502 ("Hagerman-502") in combination with U.S. Patent Publication No. 2004/0176094 ("Kim-094") together or in combination with one or more of the references identified in Exhibits D1-D14;

- U.S. Patent Publication No. 2009/0298502 ("Hagerman-502") in combination with U.S. Patent Publication No. 2005/0073977 ("Vanghi-977") together or in combination with one or more of the references identified in Exhibits D1-D14;

- U.S. Patent Publication No. 2004/0176094 ("Kim-094") in combination with LTE for UMTS: Evolution to LTE-Advanced, 2d Ed., Edited by Holma, H. and Toskala, A. (2011) ("Holma") or LTE for UMTS OFDMA and SC-FDMA Based Radio Access by Holma & Toskala ("Holma & Toskala (2009)") together or in combination with one or more of the references identified in Exhibits D1-D14;

- U.S. Patent Publication No. 2004/0176094 ("Kim-094") in combination with U.S. Patent Publication No. 2005/0073977 ("Vanghi-977") together or in combination with one or more of the references identified in Exhibits D1-D14;

- U.S. Patent Publication No. 2004/0176094 ("Kim-094") in combination with LTE for UMTS: Evolution to LTE-Advanced, 2d Ed., Edited by Holma, H. and Toskala, A. (2011) ("Holma") or LTE for UMTS OFDMA and SC-FDMA Based Radio Access by Holma & Toskala ("Holma & Toskala (2009)") together or in combination with one or more of the references identified in Exhibits D1-D14;

- U.S. Patent Publication No. US 2010/0099416A1 to Kazmi et al. ("Kazmi") in combination with LTE for UMTS: Evolution to LTE-Advanced, 2d Ed., Edited by Holma, H. and Toskala, A. (2011) ("Holma") or LTE for UMTS OFDMA and SC-FDMA Based Radio Access by Holma & Toskala ("Holma & Toskala (2009)") together or in combination with one or more of the references identified in Exhibits D1-D14;

- U.S. Patent Publication No. US 2010/0099416A1 to Kazmi et al. ("Kazmi") in combination with U.S. Patent Publication No. 2006/0111149A1("Chitrapu-149") together or in combination with one or more of the references identified in Exhibits D1-D14;

- U.S. Patent Publication No. US 2010/0099416A1 to Kazmi et al. ("Kazmi") in combination with 3GPP standards ("3GPP Standards") together or in combination with one or more of the references identified in Exhibits D1-D14;

- U.S. Patent Publication No. US 2010/0099416A1 to Kazmi et al. ("Kazmi") in combination with U.S. Patent Publication No. 2009/0298502 ("Hagerman-502") together or in combination with one or more of the references identified in Exhibits D1-D14;

- U.S. Patent Publication No. US 2010/0099416A1 to Kazmi et al. ("Kazmi") in combination with U.S. Patent Publication No. 2004/0176094 ("Kim-094") together or in combination with one or more of the references identified in Exhibits D1-D14;

- U.S. Patent Publication No. US 2010/0099416A1 to Kazmi et al. ("Kazmi") in combination with U.S. Patent Publication No. 2005/0073977 ("Vanghi-977") together or in combination with one or more of the references identified in Exhibits D1-D14;

- WO 2009/079316 ("Motorola") in combination with U.S. Patent Application No. 2010/0113002 ("Joko") and Chinese Patent No. CN 101917747 ("Huawei") together or in combination with one or more of the references identified in Exhibits D1-D14;

- WO 2009/079316 ("Motorola") in combination with U.S. Patent No. 7,289,826 ("Hovers") and Chinese Patent No. CN 101917747 ("Huawei") together or in combination with one or more of the references identified in Exhibits D1-D14;

- U.S. Patent Application No. 2010/0113002 ("Joko") in combination with Chinese Patent No. CN 101917747 ("Huawei") together or in combination with one or more of the references identified in Exhibits D1-D14;

- U.S. Patent App. No. 2010/0291931 ("Suemitsu") in combination with U.S. Patent Application No. 2010/0113002 ("Joko") and Chinese Patent No. CN 101917747 ("Huawei") together or in combination with one or more of the references identified in Exhibits D1-D14;

- Any combination of one or more of the references and/or systems identified in Exhibit D-Obviousness.

5. '361 Patent

- 3GPP TS 36.211 V12.2.0 in combination with 3GPP TS 36.300 V12.2.0 and/or 3GPP TS 36.213 V12.2.0 and/or 3GPP TS 36.331 V12.2.0 and/or 3GPP TS 36.133 V11.9.0 and/or 3GPP TR 36.828 V11.0.0 (all collectively, the "3GPP Standards") alone or in combination with one or more of the references identified in Exhibits E1-E13;

- 3GPP Standards in combination with U.S. Patent Publication No. 2017/0055257 ("Zhang-257") together or in combination with one or more of the references identified in Exhibits E1-E13;

- 3GPP Standards in combination with International Patent Publication No. WO2009/050649 ("Ho-649") together or in combination with one or more of the references identified in Exhibits E1-E13;

- 3GPP Standards in combination with U.S. Patent Publication No. 2010/0034157 ("Stolyar-157") together or in combination with one or more of the references identified in Exhibits E1-E13;

- 3GPP Standards in combination with U.S. Patent Publication No. 2014/0341051 ("Gaal-051") together or in combination with one or more of the references identified in Exhibits E1-E13;

- 3GPP Standards in combination with R1-135639 together or in combination with one or more of the references identified in Exhibits E1-E13;

- 3GPP Standards in combination with R1-132296 together or in combination with one or more of the references identified in Exhibits E1-E13;

- R1-135639 in combination with R1-132296 and/or the 3GPP Standards together or in combination with one or more of the references identified in Exhibits E1-E13;

- U.S. Patent Publication No. 2017/0055257 ("Zhang-257") in combination with International Patent Publication No. WO2009/050649 ("Ho-649") together or in combination with one or more of the references identified in Exhibits E1-E13;

- U.S. Patent Publication No. 2017/0055257 ("Zhang-257") in combination with R1-135639 and/or R1-132296 together or in combination with one or more of the references identified in Exhibits E1-E13;

- U.S. Patent Publication No. 2017/0055257 ("Zhang-257") in combination with U.S. Patent Publication No. 2010/0034157 ("Stolyar-157") together or in combination with one or more of the references identified in Exhibits E1-E13;

- U.S. Patent Publication No. 2017/0055257 ("Zhang-257") in combination with U.S. Patent Publication No. 2014/0341051 ("Gaal-051") together or in combination with one or more of the references identified in Exhibits E1-E13;

- International Patent Publication No. WO2009/050649 ("Ho-649") in combination with U.S. Patent Publication No. 2010/0034157 ("Stolyar-157") together or in combination with one or more of the references identified in Exhibits E1-E13;

- International Patent Publication No. WO2009/050649 ("Ho-649") in combination with R1-135639 and/or R1-132296 together or in combination with one or more of the references identified in Exhibits E1-E13;

- International Patent Publication No. WO2009/050649 ("Ho-649") in combination with U.S. Patent Publication No. 2014/0341051 ("Gaal-051") together or in combination with one or more of the references identified in Exhibits E1-E13;

- U.S. Patent Publication No. 2010/0034157 ("Stolyar-157") in combination with U.S. Patent Publication No. 2014/0341051 ("Gaal-051") together or in combination with one or more of the references identified in Exhibits E1-E13;

- U.S. Patent Publication No. 2010/0034157 ("Stolyar-157") in combination with R1-135639 and/or R1-132296 together or in combination with one or more of the references identified in Exhibits E1-E13;

- Any combination of one or more of the references and/or systems identified in Exhibit E-Obviousness.

D. Motivations to Combine

To the extent a finder of fact finds that any primary prior art reference does not disclose one or more limitations of an asserted claim, the asserted claim is nevertheless obvious because the allegedly missing limitations contain nothing beyond ordinary improvements. In other words, the asserted claim combines known elements to achieve predictable results or chooses between clear alternatives known to those of skill in the art, particularly in view of the state of the art as reflected in the relevant prior art.

Moreover, as explained above, it would have been obvious to a person of skill in the art at the time of the alleged invention of the asserted claims to combine any primary reference with any combination of other primary references or secondary references so as to practice the asserted claims. To the extent that Cobblestone argues that any concept claimed in the asserted claims is not disclosed in a primary reference, it would, at a minimum, have been obvious to adapt the primary reference to include the concept or combine it with other primary references or secondary

references that disclose the concept. Each concept described and claimed in the Asserted Patents was known to those of skill in the art as available design choices for various network data saving features, battery saving features, and network connectivity management functions.

The Supreme Court has held that "[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007). "When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one." *Id.* at 417. As the Supreme Court made clear, "[f]or the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill." *Id.*

To determine whether there is an apparent reason to combine the known elements in the fashion claimed by the patent at issue, a court can "look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art." *Id.* at 418. For example, obviousness can be demonstrated by showing "there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent's claims." *Id.* at 420. "[A]ny need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed." *Id.* Common sense also teaches that "familiar items may have obvious uses beyond their primary purposes, and in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle." *Id.*

However, the Supreme Court in *KSR* held that a claimed invention can be obvious even if there is no explicit teaching, suggestion, or motivation for combining the prior art to produce that invention. In summary, *KSR* holds that patents that are based on new combinations of elements or components already known in a technical field may be found to be obvious. *See, generally*, *KSR*, 127 S.Ct. 1727. Specifically, the Court in *KSR* rejected a rigid application of the "teaching, suggestion, or motivation [to combine]" test. *Id*. at 1741. "In determining whether the subject matter of a patent claim is obvious, neither the particular motivation nor the avowed purpose of the patentee controls. What matters is the objective reach of the claim." *Id*. at 1741-1742. "Under the correct analysis, any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed." *Id*. at 1742. A key inquiry is whether the "improvement is more than the predictable use of prior art elements according to their established functions." *Id*. at 1740.

The rationale to combine or modify prior art references is significantly stronger when, as here, the references seek to solve the same problem, come from the same field, and correspond well to each other. *In re Inland Steel Co*., 265 F.3d 1354, 1362 (Fed. Cir. 2001). The Federal Circuit has held that two references may be combined as invalidating art under similar circumstances, namely "[the prior art] focus[es] on the same problem that the . . . patent addresses: enhancing the magnetic properties of . . . steel. Moreover, both [prior art references] come from the same field . . . . Finally, the solutions to the identified problems found in the two references correspond well." *Id*. at 1364 (concerning patents and prior art relating to improving the magnetic and electrical properties of steel).

In view of the Supreme Court's *KSR* decision, the PTO issued a set of Examination Guidelines. Examination Guidelines for Determining Obviousness Under 35 U.S.C. §103 in view of the Supreme Court Decision in *KSR International Co. v. Teleflex, Inc.*, 72 Fed. Reg. 57526 (October 10, 2007). Those Guidelines summarized the *KSR* decision and identified various rationales for finding a claim obvious, including those based on other precedents. Those rationales include:

> (A) Combining prior art elements according to known methods to yield predictable results;
>
> (B) Simple substitution of one known element for another to obtain predictable results;
>
> (C) Use of known technique to improve similar devices (methods, or products) in the same way;
>
> (D) Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;
>
> (E) "Obvious to try" – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
>
> (F) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to one of ordinary skill in the art;
>
> (G) Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

Id. at 57529. The above rationales likewise apply in rendering obvious the asserted claims of the Asserted Patents.

The references disclosed herein, alone or in combination, contain an explicit and/or implicit teaching or motivation to combine them due to the following: (1) the knowledge generally available to a POSITA; (2) the prior art references as understood by a POSITA; (3) the nature of

the problem to be solved; (4) the fact that each prior art reference addresses similar problems; and (5) the knowledge of a POSITA that the disclosed elements had been or could be used together.

As an example of those reasons and motivations to combine, the cited prior art generally relates to wireless communications network and thus constitutes analogous art within the same field of endeavor. The prior art references depict, disclose, and discuss similar components, techniques and systems for resource allocation, frequency multiplexing, channel equalization, handover, and beam coverage claimed in the Asserted Patents. Thus, a person of ordinary skill in the art would understand the teachings of the references to be applicable to one another. A POSITA would have also found it obvious to implement (i.e., obvious to try) such combinations to utilize these well-known networking techniques in wireless communications networks. *Id*. A person of ordinary skill in the art would have been motivated to make such combinations based on, for example, the below. The below list of motivations to combine is exemplary and representative, and is not an exhaustive list of motivations to combine, nor potential combinations.

For example, a POSITA would look to the primary and secondary references discussed above to improve or tailor the disclosures thereof to help device manufacturers, wireless carriers, and customers reduce data usage and network congestion, extend battery life by decreasing power consumption, and enable users to stay connected. A POSITA would have understood and been aware of motivations to conserve system resources, increase battery life, reduce network congestion, secure communications, and cut cost by improving wireless communications networks using known methods. Accordingly, a POSITA would seek to combine or modify the disclosure of any given primary and secondary references to achieve those goals, and would have readily understood that doing so could increase device/network performance, improve user interactions

and/or satisfaction, and reduce cost. *See also* Exs. A1–E-13; Exs. A-Obviousness–E-Obviousness; First Supplemental Ex. A-Obviousness.

One of skill in the art would also have been motivated to combine the different publications and patents that were authored by employees of a given company or assigned to the same assignee and/or related to the same subject matter. Additionally, one of skill in the art would have been motivated to combine different references that were authored, developed, or invented by the same individual(s) related to the same subject matter. The common inventor/author/architect of the references demonstrate that they relate to continued work in a common field of effort and continued related developments in that field. One of skill in the art would, therefore, combine the references related to each individual. Additionally, based on the teachings of the references and/or the knowledge of one of ordinary skill, one of skill in the art would have been motivated to combine different references from the same company. For example, a POSITA would have been motivated to combine prior art systems or products (e.g., Apple devices, BlackBerry devices, Microsoft devices etc.) with any related or applicable patent or non-patent documentation or literature relating to that system or owned by the same entity, including for the reason that these materials are related.

Further, below are additional motivations to combine prior art for particular claim limitations. The following discussions of specific claim limitations are merely examples and are not limiting. For example, where a POSITA would have been motivated to combine references which together render obvious limitations from the independent claims, a POSITA would have also been motivated to combine said references in such a way as to render obvious various asserted dependent claims. The motivations identified with respect to any one Asserted Patent apply with equal force to any of the other Asserted Patents by virtue of their relationship and similarities.

1. ’802 patent

(a) Background and State of the Art

Samsung sets forth below a summary of their current understanding of the state of the art as understood as of the asserted priority date of the ’802 patent for the general subject matter of the ’802 patent. The information discussed in this section may have formed the background knowledge of a person of ordinary skill in the art at the time the ’802 patent was filed and may have been used in determining whether and how to combine references to achieve the claimed inventions. *See Randall Mfg. v. Rea*, 733 F.3d 1355, 1362 (Fed. Cir. 2013) (stating that “the knowledge [of a person of ordinary skill in the art] is part of the store of public knowledge that must be consulted when considering whether a claimed invention would have been obvious”). Samsung expressly reserve the right to rely on each of the prior art references, systems, concepts, and technologies discussed in this Section with respect to the Asserted Patent.

Samsung contends that, to the extent the primary references identified in these Preliminary Invalidity Contentions do not anticipate the Asserted Claims of the ’802 patent, it would have been obvious to combine any of the references, systems, concepts, or technologies discussed in this Section or in Samsung’s obviousness charts with those primary references. Samsung also reserves the right to rely on the discussions of the state of the art and prior art in the ’802 patent specification and its file history including file histories of related patents and foreign file histories of related patents in explaining the state of the art. Samsung further expressly reserve the right to supplement its summary of the background and state of the art, including, for example, with information from any of the authors or named inventors on any of the prior art references, by personnel familiar with systems based on any of the prior art references, or any prior art systems related to prior art

references, or by technical experts retained on behalf of any party. Samsung also expressly reserve the right to rely on any admissions by any of the named inventors, institutions with which they were associated, and Plaintiff, regarding the state of the art.

The principle of transmitting data or signals by dividing it into multiple interleaved bit streams and using these to modulate multiple carriers has been known long before the filing date of the '802 patent. *See* John A. C. Bingham, Multicarrier Modulation for Data Transmission: An Idea Whose Time Has Come, IEEE Comms. Magazine (1990) ("[This] principle . . . was used more than 30 years ago."). Digital-to-analog converters (DACs) for converting digital signals to analog signals have been in use long before the filing date of the '802 patent. Electrical circuits called mixers have been used for transferring broadcast signals from a carrier frequency to another frequency long before the filing date of the '802 patent. Electrical circuits called filters used to remove unwanted frequency content have been used long before the filing date of the '802 patent. Electrical circuits called synthesizers used to generate a range of frequencies from input reference frequencies have been used long before the filing date of the '802 patent. Electrical circuits called power amplifiers used to increase the magnitude of power of an input signal have been used long before the filing date of the '802 patent.

The concept of channel spacing, or the frequency difference between adjacent signals, has been known long before the filing of the '802 patent. *See e.g.*, 47 C.F.R. 73.44 (AM transmission system emission limitations); Vijay K. Garg, Wireless Communications & Networking (2007) at Chatper 7.5 ("The frequency separation is dependent upon the band in use (for GSM900, it is 45 MHz).")

(b) Motivation to Combine

A person of ordinary skill in the art would have been motivated to combine any of the references in its obviousness chart as they all discuss methods and systems for signal multiplexing, subband conversion, or multi-carrier signals. Moreover, these references are analogous because they all discuss signal multiplexing, subband conversion, and multi-carrier signals for wireless communications networks.

A POSITA would have had a reasonable expectation of success in making any such modifications. A POSITA would have understood that these references, as well as the POSITA's knowledge, disclose interrelated teachings based on routine technologies and would have been amenable to various well-understood and predictable combinations.

For example, a person of ordinary skill in the art would have been motivated to combine any of the the multi-carrier wireless communications systems and methods disclosed in Exs. A1-A31 and First Supplemental Ex. A-Obviousness with Etemad (Ex. A-5) and its disclosure that a primary carrier may utilize Time Division Duplex mode and a secondary carrier provides Frequency Division Duplex mode because they all involve multicarrier techniques for wireless communications systems, and a person of ordinary skill in the art would have been motivated to research protocols that can be used for each channel.

As another example, a person of ordinary skill in the art would have been motivated to combine any of the the multi-carrier wireless communications systems and methods disclosed in Exs. A1-A31 and First Supplemental Ex. A-Obviousness with Nakayama (Ex. A-16) and its particular orthogonal frequency division multiplexing modulation method because they all involve multicarrier techniques for wireless communications systems. A person of ordinary skill in the art

would have been motivated to combine aspects of Nakayama that avoid interference with existing communications systems that use narrow-band signals.

As another example, a person of ordinary skill in the art would have been motivated to combine any of the the multi-carrier wireless communications systems and methods disclosed in Exs. A1-A31 and First Supplemental Ex. A-Obviousness with Montojo (Ex. A-15) and its particular disclosure to use a single power amplifier. A person of ordinary skill in the art would have been motivated to combine such aspects of Montojo to save space, improve efficiency, and provide maximum transmission power for multi-carrier signals.

2. '196 patent

(a) Background And State Of The Art

Samsung sets forth below a summary of their current understanding of the state of the art as understood as of the asserted priority date of the '196 patent for the general subject matter of the '196 patent. The information discussed in this section may have formed the background knowledge of a person of ordinary skill in the art at the time the '196 patent was filed and may have been used in determining whether and how to combine references to achieve the claimed inventions. *See Randall Mfg. v. Rea*, 733 F.3d 1355, 1362 (Fed. Cir. 2013) (stating that "the knowledge [of a person of ordinary skill in the art] is part of the store of public knowledge that must be consulted when considering whether a claimed invention would have been obvious"). Samsung expressly reserve the right to rely on each of the prior art references, systems, concepts, and technologies discussed in this Section with respect to the Asserted Patent.

Samsung contends that, to the extent the primary references identified in these Preliminary Invalidity Contentions do not anticipate the Asserted Claims of the '196 patent, it would have been

obvious to combine any of the references, systems, concepts, or technologies discussed in this Section or in Samsung's obviousness charts with those primary references. Samsung also reserves the right to rely on the discussions of the state of the art and prior art in the '196 patent specification and its file history including file histories of related patents and foreign file histories of related patents in explaining the state of the art. Samsung further expressly reserve the right to supplement its summary of the background and state of the art, including, for example, with information from any of the authors or named inventors on any of the prior art references, by personnel familiar with systems based on any of the prior art references, or any prior art systems related to prior art references, or by technical experts retained on behalf of any party. Samsung also expressly reserve the right to rely on any admissions by any of the named inventors, institutions with which they were associated, and Plaintiff, regarding the state of the art.

The principle of a base station in a wireless network using an antenna array to form narrow beams that are directed to user devices for high-throughput transmissions, known in the art as "beamforming," has been known long before the filing date of the '196 patent. Beamforming is accomplished by utilizing constructive and destructive combinations of a signal from different closely spaced antennas transmitting multiple copies of a signal with different phases and amplitudes to focus the beam in a given direction or at a specific location.

Likewise, it was well-known in the art that base stations could cycle between wide and narrow beam patterns to adapt to the needs of mobile stations. For example, U.S. Patent No. 5,615,409 ("Forssen"), which was filed on September 25, 1995, describes a method where a "wide antenna lobe" is used to locate a mobile station, and "[a]fter the position of the mobile station has been determined, the base station can transmit signals to and receive signals from the mobile station ... with a narrow antenna

lobe." Forssen at Abstract. Forssen notes that "a narrow antenna lobe has a significantly higher spectral efficiency," and that "as the position of a mobile station is gradually determined, the base station can gradually reduce the antenna lobe width of the class two channel assigned to the mobile station. As a result, the signal quality of the mobile station can be gradually increased." Forssen at 3:41-42, 5:61-65.

A person of ordinary skill in the art would also have been aware of the well-known principle that beamform patterns could be scheduled and cycled. For example, U.S. Patent No. 8,548,525 ("Wong"), which was published on January 1, 2009, teaches a system where "various narrow and/or wide antenna patterns may be selected ... for directing to particular portions of [a] service area ... and the initial scheduling plan invoked by scheduler 242 may be adapted." Wong at 8:51-54. These antenna patterns included wide and narrow beams, with "narrow beam antenna pattern[s]" being used for "higher utilization." *Id.* at 12:58-67.

A person of ordinary skill in the art also would have been aware of the well-known techniques for providing simultaneous multi-network coverage, such as simultaneous 3G/4G coverage. For example, U.S. Patent No. 8,285,291 ("Dinan"), which was filed on February 2, 2010, teaches a "operating a dual-mode 3G/4G communications device capable of operating in either a 3G or 4G network when in an area with overlapping 3G and 4G coverage." Dinan at 7:19-22. Dinan also teaches that certain applications on a mobile station can be assigned higher or lower quality-of-service categories, which can then be assigned to 4G or 3G service depending on network availability. *Id.* at 15:3-38.

(b) Motivation to Combine

A person of ordinary skill in the art would have been motivated to combine any of the references in its obviousness chart as they all discuss methods and systems for beamforming,

cycling through beamform patterns and/or multi-network coverage. A person of ordinary skill in the art would have been aware of the well-known benefits of beamforming, cycling through beamform patterns, and multi-network coverage and would have thus looked to any of these references. Moreover, these references are analogous because they all discuss beamforming, cycling through beamform patterns, and/or multi-network coverage.

A POSITA would have had a reasonable expectation of success in making any such modifications. A POSITA would have understood that these references, as well as the POSITA's knowledge, disclose interrelated teachings based on routine technologies and would have been amenable to various well-understood and predictable combinations.

3. '347 patent

(a) Background and State of the Art

Samsung sets forth below a summary of their current understanding of the state of the art as understood as of the asserted priority date of the '347 patent for the general subject matter of the '347 patent. The information discussed in this section may have formed the background knowledge of a person of ordinary skill in the art at the time the '347 patent was filed and may have been used in determining whether and how to combine references to achieve the claimed inventions. *See Randall Mfg. v. Rea*, 733 F.3d 1355, 1362 (Fed. Cir. 2013) (stating that "the knowledge [of a person of ordinary skill in the art] is part of the store of public knowledge that must be consulted when considering whether a claimed invention would have been obvious"). Samsung expressly reserve the right to rely on each of the prior art references, systems, concepts, and technologies discussed in this Section with respect to the Asserted Patent.

Samsung contends that, to the extent the primary references identified in these Preliminary Invalidity Contentions do not anticipate the Asserted Claims of the '347 patent, it would have been obvious to combine any of the references, systems, concepts, or technologies discussed in this Section or in Samsung's obviousness charts with those primary references. Samsung also reserves the right to rely on the discussions of the state of the art and prior art in the '347 patent specification and its file history including file histories of related patents and foreign file histories of related patents in explaining the state of the art. Samsung further expressly reserve the right to supplement its summary of the background and state of the art, including, for example, with information from any of the authors or named inventors on any of the prior art references, by personnel familiar with systems based on any of the prior art references, or any prior art systems related to prior art references, or by technical experts retained on behalf of any party. Samsung also expressly reserve the right to rely on any admissions by any of the named inventors, institutions with which they were associated, and Plaintiff, regarding the state of the art.

Measuring reference signals and sending back the results of the measurement are fundamental concepts dating long before the priority date of the '347 patent. From a 2009 textbook, Holma & Toskala discuss the eNB measurements from Release 8: "The eNodeB measurements specified in the physical layer specifications in Release 8 in the downlink are as follows [4]:

- the power used (power contribution) for the resource elements that are used to transmit cell-specific reference signals from the eNodeB (in the system bandwidth);
- received interference power per physical resource block;
- thermal noise power over the system bandwidth."

Holma & Toskala (2009) at 132. The textbooks states that "The motivation for these measurements is to enable their consideration in the handover decisions of the relative base station strengths as

well as to facilitate inter-cell interference coordination, as illustrated by part of the X2-interface signaling in Chapter 5. eNodeB may use these internally for different purposes in addition to the other information available for eNodeB." Holma & Toskala (2009) at 132-33. The textbook goes on to describe three different measurements the UE performs in the LTE system:

> For the UE the following measurements are to be performed inside the LTE system:
>
> Reference Signal Received Power (RSRP), which for a particular cell is the average of the power measured (and the average between receiver branches) of the resource elements that contain cell-specific reference signals.
>
> Reference Signal Received Quality (RSRQ) is the ratio of the RSRP and the E-UTRA Carrier Received Signal Strength Indicator (RSSI), for the reference signals.
>
> E-UTRA RSSI, which is the total received wideband power on a given frequency. Thus it includes the noise 'from the whole universe' on the particular frequency, whether that is from interfering cells or any other noise source. E-UTRA RSSI is not reported by the UE as an individual measurement (as indicated in the early versions of [4] until June 2008), but it is only used in calculating the RSRQ value inside the UE.

The use of reference signals for channel estimation is described in the portion of the textbook called "OFDMA Basics" and was well known to a person of ordinary skill in the art: "This channel estimation is facilitated by having part of the symbols as known reference or pilot symbols. With the proper placement of these symbols in both the time and frequency domains, the receiver can interpolate the effect of the channel to the different sub-carriers from this time and frequency domain reference symbol 'grid'. An example is shown in Figure 4.8."

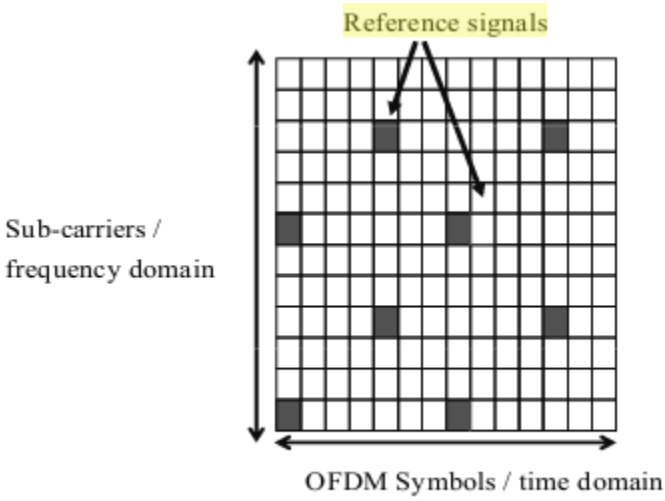


Figure 4.8 Reference symbols spread over OFDMA sub-carriers and symbols

Holma & Toskala (2009) at 72.

One type of reference signal is known as CSI-RS. Holma & Toskala describe its purpose

> The purpose of the channel state feedback reporting is to provide the eNodeB with information about the downlink channel state in order to help optimize the packet scheduling decision. The principle of the channel state feedback reporting procedure is presented in Figure
>
> 5.44. The channel state is estimated by the UE based on the downlink transmissions (reference symbols, etc.) and reported to the eNodeB by using PUCCH or PUSCH. The channel state feedback reports contain information about the scheduling and link adaptation (MCS/TBS and MIMO) related parameters the UE can support in the data reception. The eNodeB can then take advantage of the feedback information in the scheduling decision in order to optimize the usage of the frequency resources.

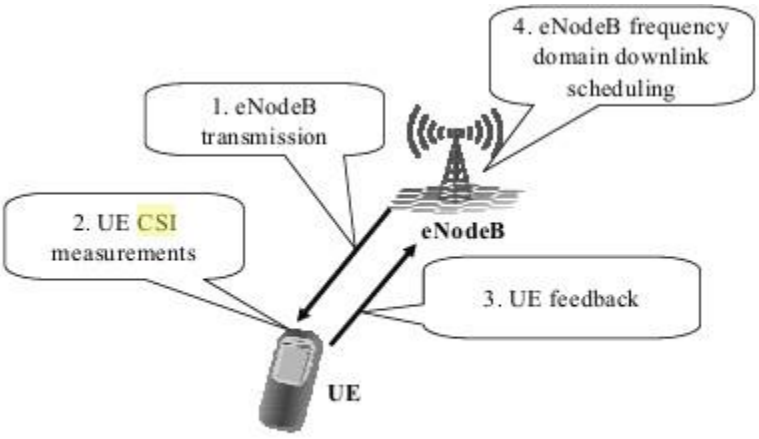


Figure 5.44 Channel State Information (CSI) reporting procedure

Holma & Toskala (2009) at 123-24. The authors go on to describe how, fundamentally, the main difference between the LTE system and its even older WCDMA counterpart is that "the LTE channel state information feedback compared to WCDMA/HSDPA is the frequency selectivity of the reports, i.e. the information regarding the distribution of channel state over the frequency domain can also be provided." Holma & Toskala (2009) at 124. The authors state that in LTE, the UE can send additional types of channel feedback information "CQI – Channel Quality Indicator," "RI – Rank Indicator," and "PMI – Pre-coding Matrix Indicator." Holma & Toskala (2009) at 123-25.

Moreover, reporting back both explicit and implicit path parameter information based on reference signals was well known in the art. In addition to all the above information described in Holma & Toskala, Sesia's *LTE: The UMTS Long Term Evolution From Theory To Practice* also teaches "Enhanced CSI Feedback":

> In Release 10, the same CQI/PMI/RI12 feedback types are used as in Release 8. As explained in Section 11.2.3, this is often described as implicit feedback, as it provides an implicit representation of the

> channel consisting of an indication of the data rate that could be achieved if the eNodeB used a certain precoder.
>
> The concept of implicit (i.e. recommended precoder) feedback can be compared to what is sometimes called explicit feedback (not supported in LTE or LTE-Advanced), whereby a UE would instead explicitly report a quantized representation of the physical CSI without making assumptions about the nature of the eNodeB precoder. Since the capacity achieved by MU-MIMO is very dependent on the accuracy of the CSI at the transmitter, explicit feedback mechanisms are often favoured in theoretical studies.

Sesia at 662-63; *see also* Exhibit A-06.

In fact, the 3GPP standards history shows that there was a robust discussion of these purported enhanced CSI parameters during the 3GPP meetings of Release 10. The meeting reports (e.g., the Meeting Report from R1 Meeting No. 60 in April 2010) show that there was a robust discussion on implicit versus explicit feedback for Release 10. R1-101711 (Final Meeting Report) at §7.2.4.

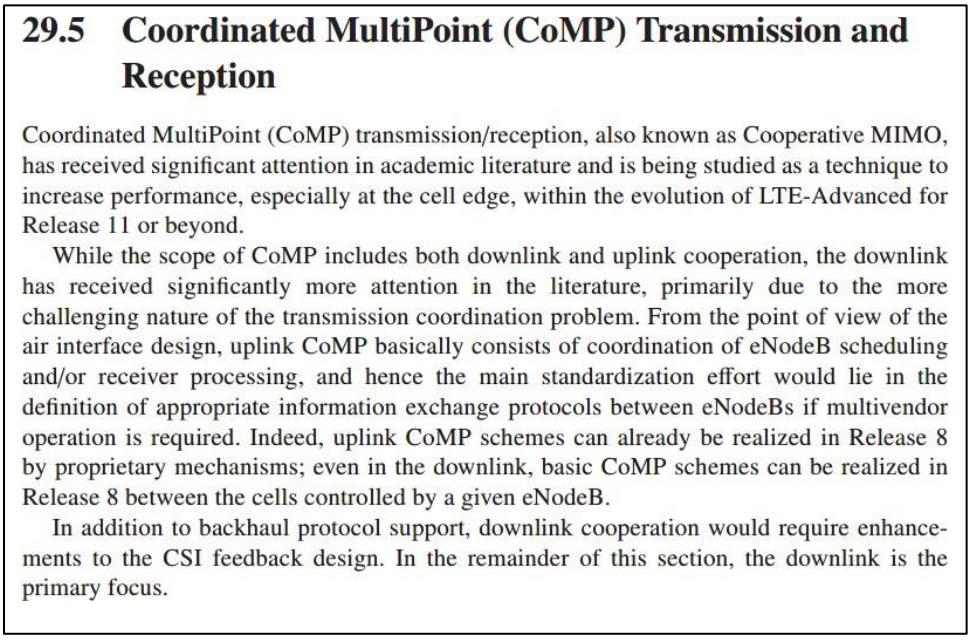
R1-100926	Clarification on explicit feedback vs. implicit feedback	Alcatel-Lucent Shanghai Bell, Alcatel-Lucent	
The document was presented by … of Alcatel-Lucent Shanghai Bell and proposes that the feedback discussion should focus on the specific types of feedback to be supported rather than on the broad categories of so-called "implicit" and "explicit. **Discussion (Question / Comment):** **Decision:** The document is noted.			

R1-101711 at § 7.2.4; *see also* R1-100889, R1-100926, R1-101429, R1-101465, R1-101488, R1-101217, R1-101129, R1-101162, R1-101218, R1-100852, R1-100927, R1-101625, R1-101683, R1-101061, R1-101382, R1-101399.

Ultimately, the group decided the "Way Forward" was to keep the previous LTE CSI. *See* R1-101399. But given the robust discussion, it would have been obvious to incorporate any one at the meetings that the enhanced or improved CSI parameters could have been used in LTE Release 10.

Separately, Nokia likewise disclosed an adaptive multi-beamforming system before the priority date of the 347 Patent. *See* U.S. Patent 7,738,925 to Nguyen et al ("Nguyen"). The adaptive multi-beamforming system uses feedback information received from the communication environment to optimize the beamforming process. This feedback may include channel quality indicators, signal strength measurements, or interference levels. The system then adjusts the beamforming parameters, such as beam weights and directions, to maximize the communication performance. Nguyen at Abs. & Cols.1-4.

As for the dependent claims, the estimation techniques and equalization techniques were long known in the art and described in various textbooks well before the priority date of the 347 Patent. For example, Dahlman & Parkvall at § 4.1 describe maximum-likelihood detection. Likewise, Sesia describe Channel Estimation techniques in Chapter 8 and specifically includes Bayesian techniques (§ 8.4.1.1) and describes Kalman filtering and Least-Mean Square (§ 8.5.2). Sesia likewise describes an entire section dedicated to CoMP.



29.5 Coordinated MultiPoint (CoMP) Transmission and Reception

Coordinated MultiPoint (CoMP) transmission/reception, also known as Cooperative MIMO, has received significant attention in academic literature and is being studied as a technique to increase performance, especially at the cell edge, within the evolution of LTE-Advanced for Release 11 or beyond.

While the scope of CoMP includes both downlink and uplink cooperation, the downlink has received significantly more attention in the literature, primarily due to the more challenging nature of the transmission coordination problem. From the point of view of the air interface design, uplink CoMP basically consists of coordination of eNodeB scheduling and/or receiver processing, and hence the main standardization effort would lie in the definition of appropriate information exchange protocols between eNodeBs if multivendor operation is required. Indeed, uplink CoMP schemes can already be realized in Release 8 by proprietary mechanisms; even in the downlink, basic CoMP schemes can be realized in Release 8 between the cells controlled by a given eNodeB.

In addition to backhaul protocol support, downlink cooperation would require enhancements to the CSI feedback design. In the remainder of this section, the downlink is the primary focus.

Sesia at ch. 29.

(b) Motivation to Combine

A person of ordinary skill in the art would have been motivated to combine any of the references in its obviousness chart as they all discuss methods and systems for measuring reference signals and sending back the results of the measurement, beamforming, and/or multi-network coverage. A person of ordinary skill in the art would have been aware of the well-known benefits of measuring reference signals and sending back the results of the measurement, beamforming, and/or multi-network coverage and would have thus looked to any of these references. Moreover, these references are analogous because they all discuss measuring reference signals and sending back the results of the measurement, beamforming, and/or multi-network coverage.

A POSITA would have had a reasonable expectation of success in making any such modifications. A POSITA would have understood that these references, as well as the POSITA's knowledge, disclose interrelated teachings based on routine technologies and would have been amenable to various well-understood and predictable combinations. A few specfic, but not limited, examples are below.

A person of ordinary skill in the art would have been motivated to combine 3GPP TS 36.211 v10.2.0 in combination with any of 3GPP TS 36.211 v10.1.0, 3GPP TS 36.212 v10.2.0, 3GPP TS 36.212 v10.1.0, 3GPP TS 36.213 v10.2.0 , 3GPP TS 36.213 v10.1.0, 3GPP TS 36.101 v10.3.0, 3GPP TS 36.101 v10.2.1, 3GPP TS 36.300 v10.4.0, 3GPP TS 36.300 v10.3.0, 3GPP TS 36.300 v10.2.0, 3GPP TS 36.133 v 10.3.0, 3GPP TS 36.133 v10.2.0 , 3GPP TS 36.133 v10.1.0, 3GPP TS 36.331 v.10.2.0 , 3GPP TS 36.331 v10.1.0, 3GPP TR 21.900 v10.0.0, 3GPP TR 21.905

v10.3.0, 3GPP TS 36.214 v10.1.0, 3GPP TS 36.302 v10.2.0, 3GPP TS 36.321 v10.2.0, 3GPP TR 25.913 v9.0.0 (collectively, the "3GPP Standards"), as the 3GPP Standards are technical specifications defining different aspects of the same standard and a person of ordinary skill in the art would understand that the 3GPP Standards were therefore meant to be read together.

A person of ordinary skill in the art would have been motivated to combine 3GPP standards ("3GPP Standards") in combination with Sesia and/or 7,738,925 and/or any of the 3GPP contributions R1-101711 at § 7.2.4; see also R1-100889, R1- 100926, R1-101429, R1-101465, R1-101488, R1-101217, R1-101129, R1-101162, R1-101218, R1-100852, R1-100927, R1-101625, R1-101683, R1-101061, R1-101382, R1-101399 in further view of TR-1101, Someya & Ohtsuki, Gini, or Dahlman & Parkvall and/or Holma & Toskala because each of these references teach fundamental building blocks of wireless data communication. In particular, a POSITA would have been motivated to combine the 3GPP Standards with any of the R1 standards contributions because those contributions were being discussed and provided to propose specific changes to the 3GPP standards. Each 3GPP standard comes from Release 10 and each R1 contribution was being discussed for LTE Release 10. Moreover, Sesia, TR-1101, Someya & Ohtsuki, Gini, or Dahlman & Parkvall and/or Holma & Toskala all describe well-known features that were long described in the art of wireless communication. A POSITA would have been motivated to look to basic textbooks on LTE and LTE-Advanced as well as specific standards contributions made to LTE and LTE-Advanced because each of those references deal with the same subject matter. Each document is analogous art because they all relate to 3GPP based wireless communication and/or channel estimation on a wireless channel.

A person of ordinary skill in the art would have been motivated to combine Sesia in combination with any of the 3GPP contributions R1-101711 at § 7.2.4; see also R1-100889, R1-100926, R1-101429, R1-101465, R1-101488, R1-101217, R1- 101129, R1-101162, R1-101218, R1-100852, R1-100927, R1-101625, R1-101683, R1-101061, R1-101382, R1-101399 in further view of TR-1101, Someya & Ohtsuki, Gini, or Dahlman & Parkvall and/or Holma & Toskala for the same reasons described above. A POSITA would have been motivated to look to basic textbooks on LTE and LTE-Advanced as well as specific standards contributions made to LTE and LTE-Advanced because each of those references deal with the same subject matter. Each document is analogous art because they all relate to 3GPP based wireless communication and/or channel estimation on a wireless channel.

A person of ordinary skill in the art would have been motivated to combine U.S. Patent Application No. US 2006/0210070 to Reznik et al. ("Reznik") in further view of Sesia, TR-1101, Someya & Ohtsuki, Gini, or Dahlman & Parkvall and/or Holma & Toskala because Reznik discusses baseline UMTS and CDMA systems and those textbooks describe further development of the same systems. A POSITA would have been motivated to look to basic textbooks on UMTS, LTE and LTE- Advanced. For example, the Holma & Toskala books contains similar subject matter because they describe base UMTS systems and the advancement of those systems through LTE and LTE-Advanced. Each reference contains similar subject matter (e.g., channel estimation). Each document is analogous art because they all relate to 3GPP based wireless communication and/or channel estimation on a wireless channel.

A person of ordinary skill in the art would have been motivated to combine U.S. Patent Application US 2003/0153360 to Burke et al. ("Burke") in further view of Sesia TR-1101, Someya

& Ohtsuki, Gini, or Dahlman & Parkvall and/or Holma & Toskala because Burke describes baseline CDMA channel estimation and those textbooks describe further development of the same systems. A POSITA would have been motivated to look to basic textbooks on UMTS, LTE and LTE- Advanced. For example, the Holma & Toskala books contains similar subject matter because they describe base UMTS systems and the advancement of those systems through LTE and LTE-Advanced. Each reference contains similar subject matter (e.g., channel estimation). Each document is analogous art because they all relate to 3GPP based wireless communication and/or channel estimation on a wireless channel.

A person of ordinary skill in the art would have been motivated to combine U.S. Patent Application No. US 2010/0215113 to Lindgren et al. ("Lindgren") in further view of Sesia, TR-1101, Someya & Ohtsuki, Gini, or Dahlman & Parkvall and/or Holma & Toskala because Lindgren describes a 3GPP telecommunication system and the textbooks cited above are further descriptions of 3GPP's development of the same system. Each reference contains similar subject matter (e.g., channel estimation). Each document is analogous art because they all relate to 3GPP based wireless communication and/or channel estimation on a wireless channel.

A person of ordinary skill in the art would have been motivated to combine U.S. Patent Application No. US 2006/0286974 to Gore et al. ("Gore") in further view of Sesia, TR-1101, Someya & Ohtsuki, Gini, or Dahlman & Parkvall and/or Holma & Toskala for similar reasons described above. Gore describes MIMO beamforming and channel estimation, which is also described in each of the textbooks referenced. Each reference contains similar subject matter (e.g., channel estimation). Each document is analogous art because they all relate to 3GPP based wireless communication and/or channel estimation on a wireless channel.

A person of ordinary skill in the art would have been motivated to combine Sesia et al., LTE: The UMTS Long Term Evolution From Theory To Practice ("Sesia") in further view of TR-1101, Someya & Ohtsuki, Gini, or Dahlman & Parkvall and/or Holma & Toskala for the same reasons described above. These references are all textbook descriptions of what had been described in the art, and a POSITA would have looked to basic building blocks of the system design contained in the textbooks. Each document is analogous art because they all relate to 3GPP based wireless communication and/or channel estimation on a wireless channel.

A POSITA would have had a reasonable expectation of success in making any such modifications. A POSITA would have understood that these references, as well as the POSITA's knowledge, disclose interrelated teachings based on routine technologies and would have been amenable to various well-understood and predictable combinations.

4. '888 patent

(a) Background And State Of The Art

Samsung sets forth below a summary of their current understanding of the state of the art as understood as of the asserted priority date of the '888 patent for the general subject matter of the '888 patent. The information discussed in this section may have formed the background knowledge of a person of ordinary skill in the art at the time the '888 patent was filed and may have been used in determining whether and how to combine references to achieve the claimed inventions. *See Randall Mfg. v. Rea*, 733 F.3d 1355, 1362 (Fed. Cir. 2013) (stating that "the knowledge [of a person of ordinary skill in the art] is part of the store of public knowledge that must be consulted when considering whether a claimed invention would have been obvious").

Samsung expressly reserve the right to rely on each of the prior art references, systems, concepts, and technologies discussed in this Section with respect to the Asserted Patent.

Samsung contends that, to the extent the primary references identified in these Preliminary Invalidity Contentions do not anticipate the Asserted Claims of the '888 patent, it would have been obvious to combine any of the references, systems, concepts, or technologies discussed in this Section or in Samsung's obviousness charts with those primary references. Samsung also reserves the right to rely on the discussions of the state of the art and prior art in the '888 patent specification and its file history including file histories of related patents and foreign file histories of related patents in explaining the state of the art. Samsung further expressly reserve the right to supplement its summary of the background and state of the art, including, for example, with information from any of the authors or named inventors on any of the prior art references, by personnel familiar with systems based on any of the prior art references, or any prior art systems related to prior art references, or by technical experts retained on behalf of any party. Samsung also expressly reserve the right to rely on any admissions by any of the named inventors, institutions with which they were associated, and Plaintiff, regarding the state of the art.

The "handover" procedure is a long-existing procedure. The 2G, 3G, and 4G cellular networks rely on the concept of handover. As mobile networks matured, a number of different types of handover emerged. In 3GPP systems, two types of handover are intra-Radio Access Technology (RAT) handover and inter-RAT handover. For example, in intra-LTE handover, the source and target are both in the LTE system. Holma and Toskala at 159. For inter-RAT handover, the source base station, such as an eNodeB, can decide a target RAT, which could have been UTRAN, GERAN, or CDMA2000 system prior to the alleged priority date of the '888 Patent. *Id.*

The procedures for inter-radio access technology handover to other Radio Access Technology (specifically, handover between an LTE network and another RAT), as standardized in 3GPP TS 36.300 (among other sections), were well known in the art prior to the alleged priority date of the '888 Patent. It was known in the prior art that, based on UE measurement reporting, the source base station—and LTE eNodeB for example—can decide the target Radio Access Technology (RAT), which could be different from the source RAT, e.g., LTE. It was known in the prior art to send a MEASUREMENT REPORT signaling message transmitted by the UE to the LTE Network (via the source eNodeB) regarding the received signal strength of other possible target base stations before the source eNodeB can determine which possible target cell would be most suitable for the handover. TS 36.300 V10.3.0 § 10.1.2 ("Source eNB makes decision based on MEASUREMENT REPORT and RRM information to hand off UE."). *See also* Exhibit B-01. Another message known in the prior art was the HANDOVER REQUEST signaling message to the target base station (via the source base station). The handover process is triggered when certain conditions are met. These conditions can include factors such as deteriorating signal quality, reaching a coverage boundary, congestion in the current cell, or network-specific parameters. The network or the User Equipment (UE) can initiate the handover process based on these triggers. In addition, adapting the 4G network to prepare for the handover was well known. When the handover is triggered the target eNodeB receives a S1: Handover Request message from MME, it allocates the necessary resources, builds the RRC Connection Reconfiguration message (= Handover Command) and sends it in the S1: Handover Request Acknowledge message to MME. Thus this RRC Connection Reconfiguration message will be transferred to the UE via source RAT. Holma 2009. Part of allocating the necessary resources for the UE included establishing radio

bearers and bandwidth to accommodate the UE's handover. In LTE beamforming scenarios, the specific beam or beams allocated for the UE depend on factors such as the UE's location, signal conditions, network load, and the beamforming capabilities of the 4G network.

(b) Motivation to Combine

A person of ordinary skill in the art would have been motivated to combine any of the references in its obviousness chart as they all discuss methods and systems for handovers, beamforming, and/or multi-network coverage. A person of ordinary skill in the art would have been aware of the well-known benefits of handovers, beamforming, and/or multi-network coverage and would have thus looked to any of these references. Moreover, these references are analogous because they all discuss handovers, beamforming, and/or multi-network coverage.

A POSITA would have had a reasonable expectation of success in making any such modifications. A POSITA would have understood that these references, as well as the POSITA's knowledge, disclose interrelated teachings based on routine technologies and would have been amenable to various well-understood and predictable combinations. A few specfic, but not limited, examples are below.

A person of ordinary skill in the art would have been motivated to combine 3GPP TS 36.300 v10.3.0 and/or 3GPP TS 23.401 v10.3.0 and/or 3GPP TS 36.331v10.1.0 and/or 3GPP TS 36.211 v10.1.0 and/or 3GPP TS 36.213 v10.1.0 and/or 3GPP TS 36.214 v10.1.0 and/or 3GPP TS 36.321 v10.1.0 and/or 3GPP TS 36.306v10.1.0 (collectively, the "3GPP Standards"), as the 3GPP Standards are technical specifications defining different aspects of the same standard and a person of ordinary skill in the art would understand that the 3GPP Standards were therefore meant to be read together.

A person of ordinary skill in the art would have been motivated to combine the 3GPP standards ("3GPP Standards") in combination with U.S. Patent Publication No. 2006/0111149A1 ("Chitrapu-149"), as the 3GPP standards show the standardization of the methods and systems disclosed in Chitrapu. Moreover, both references discuss handover and the steps necessary to complete a handover. Further the 3GPP Standards and Chitrapu-149 are analogous art as they both disclose handover.

A person of ordinary skill in the art would have been motivated to combine the 3GPP standards ("3GPP Standards") in combination with LTE for UMTS: Evolution to LTE-Advanced, 2d Ed., Edited by Holma, H. and Toskala, A. (2011) ("Holma") or LTE for UMTS OFDMA and SC-FDMA Based Radio Access by Holma & Toskala ("Holma & Toskala (2009)") as the 3GPP standards show the standardization of the methods and systems disclosed in Holma and Holma 2009. A POSITA would have looked to Holma and Holma 2009 as they describe textbook principles about the standard. Moreover, both references discuss handover and the steps necessary to complete a handover. Further the 3GPP Standards and Holma and Holma 2009 are analogous art as they both disclose handover.

A person of ordinary skill in the art would have been motivated to combine 3GPP standards ("3GPP Standards") in combination with U.S. Patent Publication No. 2004/0176094 ("Kim-094") as the 3GPP standards show the standardization of the methods and systems disclosed in Kin-094. Moreover, both references discuss handover and the steps necessary to complete a handover. Further the 3GPP Standards and Kim-094 are analogous art as they both disclose handover.

A person of ordinary skill in the art would have been motivated to combine 3GPP standards ("3GPP Standards") in combination with U.S. Patent Publication No. 2009/0298502 ("Hagerman-

502") as the 3GPP standards show the standardization of the methods and systems disclosed in Hagerman-502. Moreover, both references discuss handover and the steps necessary to complete a handover. Further the 3GPP Standards and Hagerman-502 are analogous art as they both disclose handover.

A person of ordinary skill in the art would have been motivated to combine 3GPP standards ("3GPP Standards") in combination with U.S. Patent Publication No. 2005/0073977 ("Vanghi-977") as the 3GPP standards show the standardization of the methods and systems disclosed in Vanghi-977. Moreover, both references discuss handover and the steps necessary to complete a handover. Further the 3GPP Standards and Vanghi-977 are analogous art as they both disclose handover.

A person of ordinary skill in the art would have been motivated to combine U.S. Patent Publication No. 2006/0111149A1 ("Chitrapu-149") in combination with U.S. Patent Publication No. 2009/0298502 ("Hagerman-502") as both references discuss handover and the steps necessary to complete a handover. Further the Chitrapu-149 and Hagerman-502 are analogous art as they both disclose handover.

A person of ordinary skill in the art would have been motivated to combine U.S. Patent Publication No. 2006/0111149A1("Chitrapu-149") in combination with LTE for UMTS: Evolution to LTE-Advanced, 2d Ed., Edited by Holma, H. and Toskala, A. (2011) ("Holma") or LTE for UMTS OFDMA and SC-FDMA Based Radio Access by Holma & Toskala ("Holma & Toskala (2009)") as both references discuss handover and the steps necessary to complete a handover. Moreover, Holma and Holma 2009 describe textbook principles about the methods and

systems described in Chitrapu-149. Further the Chitrapu-149 and Holma and Holma 2009 are analogous art as they both disclose handover.

A person of ordinary skill in the art would have been motivated to combine U.S. Patent Publication No. 2006/0111149A1("Chitrapu-149") in combination with U.S. Patent Publication No. 2004/0176094 ("Kim-094") as both references discuss handover and the steps necessary to complete a handover. Further the Chitrapu-149 and Kim-094 are analogous art as they both disclose handover.

A person of ordinary skill in the art would have been motivated to combine U.S. Patent Publication No. 2006/0111149A1("Chitrapu-149") in combination with U.S. Patent Publication No. 2005/0073977 ("Vanghi-977") as both references discuss handover and the steps necessary to complete a handover. Further the Chitrapu-149 and Vanghi-977 are analogous art as they both disclose handover.

A person of ordinary skill in the art would have been motivated to combine U.S. Patent Publication No. 2009/0298502 ("Hagerman-502") in combination with LTE for UMTS: Evolution to LTE-Advanced, 2d Ed., Edited by Holma, H. and Toskala, A. (2011) ("Holma") or LTE for UMTS OFDMA and SC-FDMA Based Radio Access by Holma & Toskala ("Holma & Toskala (2009)") as both references discuss handover and the steps necessary to complete a handover. Moreover, Holma and Holma 2009 describe textbook principles about the methods and systems described in Hagerman-502. Further the Hagerman-502 and Holma and Holma 2009 are analogous art as they both disclose handover.

A person of ordinary skill in the art would have been motivated to combine U.S. Patent Publication No. 2009/0298502 ("Hagerman-502") in combination with U.S. Patent Publication

No. 2004/0176094 ("Kim-094") as both references discuss handover and the steps necessary to complete a handover. Further the Hagerman-502 and Kim-094 are analogous art as they both disclose handover.

A person of ordinary skill in the art would have been motivated to combine U.S. Patent Publication No. 2009/0298502 ("Hagerman-502") in combination with U.S. Patent Publication No. 2005/0073977 ("Vanghi-977") as both references discuss handover and the steps necessary to complete a handover. Further the Hagerman-502 and Vanghi-977 are analogous art as they both disclose handover.

A person of ordinary skill in the art would have been motivated to combine U.S. Patent Publication No. 2004/0176094 ("Kim-094") in combination with LTE for UMTS: Evolution to LTE-Advanced, 2d Ed., Edited by Holma, H. and Toskala, A. (2011) ("Holma") or LTE for UMTS OFDMA and SC-FDMA Based Radio Access by Holma & Toskala ("Holma & Toskala (2009)") as both references discuss handover and the steps necessary to complete a handover. Moreover, Holma and Holma 2009 describe textbook principles about the methods and systems described in Kim-094. Further the Kim-094 and Holma and Holma 2009 are analogous art as they both disclose handover.

A person of ordinary skill in the art would have been motivated to combine U.S. Patent Publication No. 2004/0176094 ("Kim-094") in combination with U.S. Patent Publication No. 2005/0073977 ("Vanghi-977") as both references discuss handover and the steps necessary to complete a handover. Further the Kim-094 and Vanghi-977 are analogous art as they both disclose handover.

A person of ordinary skill in the art would have been motivated to combine U.S. Patent Publication No. US 2010/0099416A1 to Kazmi et al. ("Kazmi") in combination with LTE for UMTS: Evolution to LTE-Advanced, 2d Ed., Edited by Holma, H. and Toskala, A. (2011) ("Holma") or LTE for UMTS OFDMA and SC-FDMA Based Radio Access by Holma & Toskala ("Holma & Toskala (2009)") as both references discuss handover and the steps necessary to complete a handover. Moreover, Holma and Holma 2009 describe textbook principles about the methods and systems described in Kazmi. Further the Kazmi and Holma and Holma 2009 are analogous art as they both disclose handover.

A person of ordinary skill in the art would have been motivated to combine U.S. Patent Publication No. US 2010/0099416A1 to Kazmi et al. ("Kazmi") in combination with U.S. Patent Publication No. 2006/0111149A1("Chitrapu-149") as both references discuss handover and the steps necessary to complete a handover. Further the Kazmi and Chitrapu-149 are analogous art as they both disclose handover.

A person of ordinary skill in the art would have been motivated to combine U.S. Patent Publication No. US 2010/0099416A1 to Kazmi et al. ("Kazmi") in combination with 3GPP standards ("3GPP Standards") as the 3GPP standards show the standardization of the methods and systems disclosed in Kazmi. Both references discuss handover and the steps necessary to complete a handover. Further the Kazmi and 3GPP Standards are analogous art as they both disclose handover.

A person of ordinary skill in the art would have been motivated to combine U.S. Patent Publication No. US 2010/0099416A1 to Kazmi et al. ("Kazmi") in combination with U.S. Patent Publication No. 2009/0298502 ("Hagerman-502) as both references discuss handover and the steps

necessary to complete a handover. Further the Kazmi and Hagerman-502 are analogous art as they both disclose handover.

A person of ordinary skill in the art would have been motivated to combine U.S. Patent Publication No. US 2010/0099416A1 to Kazmi et al. ("Kazmi") in combination with U.S. Patent Publication No. 2004/0176094 ("Kim-094") as both references discuss handover and the steps necessary to complete a handover. Further the Kazmi and Kim-094 are analogous art as they both disclose handover.

A person of ordinary skill in the art would have been motivated to combine U.S. Patent Publication No. US 2010/0099416A1 to Kazmi et al. ("Kazmi") in combination with U.S. Patent Publication No. 2005/0073977 ("Vanghi-977") as both references discuss handover and the steps necessary to complete a handover. Further the Kazmi and Vanghi-977 are analogous art as they both disclose handover.

A POSITA would have had a reasonable expectation of success in making any such modifications. A POSITA would have understood that these references, as well as the POSITA's knowledge, disclose interrelated teachings based on routine technologies and would have been amenable to various well-understood and predictable combinations.

5. '361 patent

(a) Background and State of the Art

Samsung sets forth below a summary of their current understanding of the state of the art as understood as of the asserted priority date of the '361 patent for the general subject matter of the '361 patent. The information discussed in this section may have formed the background knowledge of a person of ordinary skill in the art at the time the '361 patent was filed and may

have been used in determining whether and how to combine references to achieve the claimed inventions. *See Randall Mfg. v. Rea*, 733 F.3d 1355, 1362 (Fed. Cir. 2013) (stating that "the knowledge [of a person of ordinary skill in the art] is part of the store of public knowledge that must be consulted when considering whether a claimed invention would have been obvious"). Samsung expressly reserve the right to rely on each of the prior art references, systems, concepts, and technologies discussed in this Section with respect to the Asserted Patent.

Samsung contends that, to the extent the primary references identified in these Preliminary Invalidity Contentions do not anticipate the Asserted Claims of the '361 patent, it would have been obvious to combine any of the references, systems, concepts, or technologies discussed in this Section or in Samsung's obviousness charts with those primary references. Samsung also reserves the right to rely on the discussions of the state of the art and prior art in the '361 patent specification and its file history including file histories of related patents and foreign file histories of related patents in explaining the state of the art. Samsung further expressly reserve the right to supplement its summary of the background and state of the art, including, for example, with information from any of the authors or named inventors on any of the prior art references, by personnel familiar with systems based on any of the prior art references, or any prior art systems related to prior art references, or by technical experts retained on behalf of any party. Samsung also expressly reserve the right to rely on any admissions by any of the named inventors, institutions with which they were associated, and Plaintiff, regarding the state of the art.

The allocation and scheduling of frequency spectrum resources in a wireless network was known in the art prior to the earliest alleged priority date of the '361 Patent. For example, duplex communication schemes, such as time-division duplex (TDD) and frequency-division duplex

(FDD) systems were known schemes for allocation of frequency spectrum resources for uplink and downlink traffic. *See* '361 Patent at 3:29-38. The basic principle of TDD known in the art prior to the '361 Patent's earliest alleged priority date is to use the same frequency band for transmission and reception but to alternate the transmission direction in time. Holma and Toskala (2011) at p. 455-56. That is, transmission in the uplink and downlink direction are transmitted on, and share, the same frequency band in a TDD allocation scheme, as shown in the figure below illustrating the differences between FDD and TDD modes.

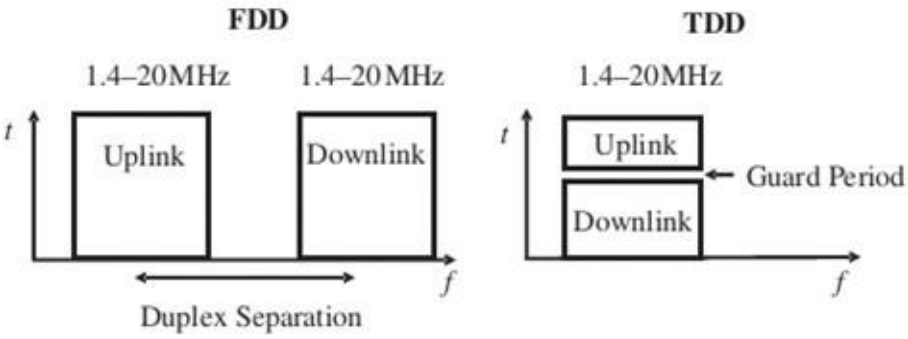


Figure 15.1 Principles of FDD and TDD modes of operation

Id. at 456. A known advantage of TDD in the prior art was the ability to adjust the available system resources, including frequency resources, to either downlink or uplink to perfectly match the uplink and downlink traffic characteristics. *Id*. at 459. In particular, the dynamic allocation of frequency spectrum resources to a shared resource pool based on a channel quality measurement—the subject of the challenged claims—was known in the art prior to the earliest alleged priority date of the '361 Patent.

For example, various articles describe algorithms for allocating resources between uplink and downlink channels in TDD. For example, as early as 2002, in Cochannel Interference

Reduction in Dynamic-TDD Fixed Wireless Applications, Using Time Slot Allocation Algorithms, the authors were discussing the various algorithms based off channel measurements to use to decide how to allocate channels between uplink and downlink. *See* Jeong at 1-5. Likewise, in 2004, the authors of Modeling Dynamic Channel-Allocation Algorithms in Multi-BS TDD Wireless Networks With Internet-Based Traffic modeled the various algorithms to optimize the allocation of resource blocks to avoid packet loss in the network. *See* Cooper at 1-23. In 2002, in a paper titled Dynamic Channel Allocation Using a Genetic Algorithm for a TDD Broadband Fixed Wireless Access Network, the authors noted how channels were re-used, which causes co-channel and adjacent channel interference, and modeled the best algorithms to optimize network resources while reducing the amount interference. *See* Wong at 1-5.

Likewise, flexible bandwidth assignment based on channel conditions was long known in the art. Dahlman and Parkvall describe this in Chapter 4 of 4G LTE/LTE-Advanced for Mobile Broadband. Referring to Figure 4.7 (reproduced below), they state the following:

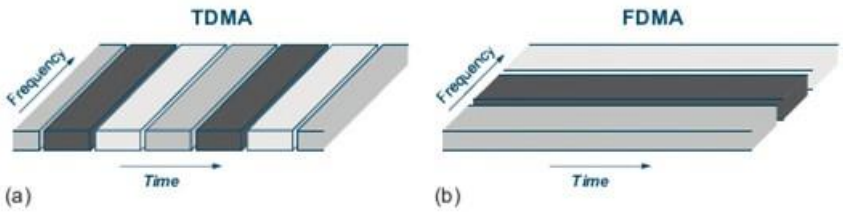


FIGURE 4.6

Orthogonal multiple access: (a) TDMA; (b) FDMA.

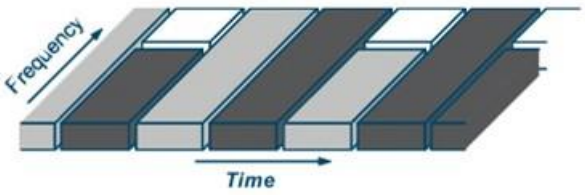


FIGURE 4.7

FDMA with flexible bandwidth assignment.

At the same time, it should be possible to allocate the entire overall transmission bandwidth to a single terminal when the channel conditions are such that the wide bandwidth can be efficiently utilized – that is, when the achievable data rates are not power limited. Thus, an orthogonal uplink transmission scheme should allow for FDMA with flexible bandwidth assignment, as illustrated in Figure 4.7. Flexible bandwidth assignment is straightforward to achieve with an OFDM-based uplink transmission scheme by dynamically allocating different number of subcarriers to different terminals depending on their instantaneous channel conditions. In the next section, it will be discussed how this can also be achieved in the case of low-PAR "single-carrier" transmission, more specifically by means of so-called DFT-spread OFDM.

In addition, 3GPP discussed and adopted Enhanced Interference Mitigation & Traffic Adaptation (eIMTA), an improvement to the LTE TDD mode, prior to the alleged priority date of the '361 Patent. *See, e.g.*, Draft Minutes Report RAN#77 v020 at 87; R1-142772; R1-142771. eIMTA allows dynamic reconfiguration of UL/DL time slots within the LTE frame structure. In

prior art TDD, there are seven possible frame configurations for the allocation of frequency resources for uplink and downlink shown in the table below.

UL/DL Configuration	Subframe number									
	0	1	2	3	4	5	6	7	8	9
0	D	S	U	U	U	D	S	U	U	U
1	D	S	U	U	D	D	S	U	U	D
2	D	S	U	D	D	D	S	U	D	D
3	D	S	U	U	U	D	D	D	D	D
4	D	S	U	U	D	D	D	D	D	D
5	D	S	U	D	D	D	D	D	D	D
6	D	S	U	U	U	D	S	U	U	D

Roessler at 41. Prior to the alleged priority date of the patent, LTE TDD allowed for asymmetric UL-DL allocations by providing these seven different semi-statically configured uplink-downlink configurations. 3GPP TR 36.828 V11.0.0; 3GPP TS 36.211 V12.2.0 Table 4.2-2.

The introduction of eIMTA prior to the '361 Patent allowed the reconfiguration of UL-DL allocation in a flexible way based on channel conditions and traffic load. *Id*. Specifically, subframes can be classified as dynamic subframes whose direction can be dynamically changed (e.g. managed as UL and DL subframes), rather than having a fixed direction (e.g., as either a DL subframe or an UL subframe). Gaal-051 at Para. [0071]. In the eIMTA prior art systems, these TDD DL/UL subframes are dynamically adapted based on actual traffic needs, and as a result of interference or channel state. Thus, it was known in the prior art that dynamic resource allocation and UL or DL directionality for TDD subframes depend on channel and interference measurements. *Id*. at Para. [0087].

eIMTA was proposed and standardized by 3GPP prior to the alleged priority date of the '361 Patent. *See, e.g.*, Draft Minutes Report RAN#77 v020 at 87; R1-142772; R1-142771.

During GRAN Meeting #51 in March 2011, a study item "Further Enhancements to LTE TDD for DL-UL Interference Management and Traffic Adaptation" was agreed. *See* RP-110450; RP-110855 at 77. In the study item, RAN1 was tasked with evaluating the benefits of uplink-downlink resource reconfiguration dependent on interference mitigation and traffic adaptation. RP-110450. T-doc contributions were subsequently made to RAN1 related to the design and development of the eIMTA feature. *See, e.g.*, R1-130015. For example, R1-130015 proposed that the eNodeB's TDD allocation, or UL-DL configuration and scheduling strategies could be based on the eNodeB's measurement of interference information, or channel quality. R1-130015 at 2-3 ("And, the eNB can adjust the scheduling strategies to resist the inter-cell interference. . . Firstly, the eNB needs to anticipate or measure the interference information, with differentiating between subframes with and without BS-BS/UE-UE interference, e.g. which group of subframes will suffer or are suffering BS-BS/UE-UE interference, or which group subframes will generate or are suffering BS-BS/UE-UE interference. Secondly, the eNodeB adjusts the scheduling strategies according to the interference information."). As another example, Nokia proposed an enhancement to channel state information (CSI) with TDD eIMTA because the same CQI for fixed DL subframes are not necessarily valid for TDD eIMTA flexible subframes due to DL-to-DL and UL-to-DL interference. R1-132296 at 1-2. Thus, Nokia proposed configuring a separate CSI measurement and reporting mechanism for eIMTA flexible subframes. *Id.* Thus, the prior art eIMTA enabling flexible UL-DL resource allocation based on channel status was known in the art prior to the alleged priority date of the '361 Patent. Ericsson also proposed contributions related to CSI measurement and reporting for eIMTA flexible subframes prior to the alleged priority date of the '361 Patent. R1-135639 at 1-2.

The Meeting Report for RAN1 #77 indicates the change requests introducing the release 12 eIMTA feature into the standards were agreed prior to the alleged priority date of the '361 Patent. *See* Draft Minutes Report RAN#77 v020 at 87; R1-142772; R1-142771.

In addition, carrier aggregation was known in the art prior to the alleged priority date of the '361 Patent. Prior art LTE Release 8 and Release 9 specified system bandwidths of 1.4, 3, 5, 10, 15, and 20 MHz to meet different spectrum and deployment requirements. Ahmadi at 985. A distinctive improvement to these prior art systems was the support of wider bandwidths up to 100 MHz. *Id*. to support wider transmission bandwidths, LTE Release 10 introduced the carrier aggregation concept, where two or more component carriers with arbitrary bandwidths belonging to the same or different frequency bands could be aggregated. *Id*. Using the carrier aggregation scheme, it would be possible to simultaneously schedule a user on multiple component carriers for downlink or uplink data transmission. *Id*. at 986. It was known in the art prior to the alleged priority date of the '361 Patent that carrier aggregation is supported in both the FDD and TDD. *Id*. Notably, prior to the alleged priority date of the '361 Patent. Nokia was the first to demonstrate the use of TDD FDD carrier aggregation at Mobile Asia Expo in June 2014. *See* Nokia TDD-FDD LTE Carrier Aggregation Video.

(b) Motivation to Combine

A person of ordinary skill in the art would have been motivated to combine any of the references in its obviousness chart as they all discuss methods and systems for allocation and scheduling of frequency spectrum resources, carrier aggregation, DD-FDD LTE Carrier Aggregation, and/or dynamic resource allocation. A person of ordinary skill in the art would have been aware of the well-known benefits of hallocation and scheduling of frequency spectrum

resources, carrier aggregation, DD-FDD LTE Carrier Aggregation, and/or dynamic resource allocation and would have thus looked to any of these references. Moreover, these references are analogous because they all discuss handovers, beamforming, and/or multi-network coverage.

A POSITA would have had a reasonable expectation of success in making any such modifications. A POSITA would have understood that these references, as well as the POSITA's knowledge, disclose interrelated teachings based on routine technologies and would have been amenable to various well-understood and predictable combinations. A few specfic, but not limited, examples are below.

A person of ordinary skill in the art would have been motivated to combine 3GPP TS 36.211 V12.2.0 in combination with 3GPP TS 36.300 V12.2.0 and/or 3GPP TS 36.213 V12.2.0 and/or 3GPP TS 36.331 V12.2.0 and/or 3GPP TS 36.133 V11.9.0 and/or 3GPP TR 36.828 V11.0.0 (collectively, the "3GPP Standards"), as the 3GPP Standards are technical specifications defining different aspects of the same standard and a person of ordinary skill in the art would understand that the 3GPP Standards were therefore meant to be read together.

A person of ordinary skill in the art would have been motivated to combine the 3GPP Standards in combination with U.S. Patent Publication No. 2017/0055257 ("Zhang-257") as the 3GPP Standards show the standardization of the methods and systems disclosed in Zhang-257. Moreover, the 3GPP Standards and Zhang- 257 are analogous because they both discuss the dynamic allocation of wireless communication resources.

A person of ordinary skill in the art would have been motivated to combine the 3GPP Standards in combination with International Patent Publication No. WO2009/050649 ("Ho-649") as the 3GPP Standards show the standardization of the methods and systems disclosed in Ho-649.

In addition, Ho-649 explicitly states that its disclosure re-allocation of resources based on channel quality is applicable to systems based on 3GPP. Thus, a person of ordinary skill in the art would be motivated read Ho-649 in view of the 3GPP Standards. Moreover, the 3GPP standards and Ho-649 are analogous because they both discuss the dynamic allocation of wireless communication resources.

A person of ordinary skill in the art would have been motivated to combine the 3GPP Standards in combination with U.S. Patent Publication No. 2010/0034157 ("Stolyar-157") as the 3GPP Standards show the standardization of the methods and systems disclosed in Stolyar-157. Moreover, the 3GPP Standards and Stolyar- 157 are analogous because they both discuss the dynamic allocation of wireless communication resources.

A person of ordinary skill in the art would have been motivated to combine the 3GPP Standards in combination with U.S. Patent Publication No. 2014/0341051 ("Gaal-051") as the 3GPP Standards show the standardization of the methods and systems disclosed in Gaal-051. In addition, a person of ordinary skill in the art would be motivated to read the 3GPP Standards with Gaal-051 because Gaal-051 discloses the eIMTA feature described and specified in the standard. Moreover, the 3GPP standards and Gaal-051 are analogous because they both discuss the dynamic allocation of wireless communication resources.

A person of ordinary skill in the art would have been motivated to combine the 3GPP Standards in combination with R1-135639, as R1-135639 was submitted as a technical contribution to the same 3GPP standard. Thus, a person of ordinary skill in the art would have understood that 3GPP technical contributions were intended to be read and understood in view of the 3GPP Standards.

A person of ordinary skill in the art would have been motivated to combine the 3GPP Standards in combination with R1-132296, as R1-132296 was submitted as a technical contribution to the same 3GPP standard. Thus, a person of ordinary skill in the art would have understood that 3GPP technical contributions were intended to be read and understood in view of the 3GPP Standards.

A person of ordinary skill in the art would have been motivated to combine R1- 132296 in combination with R1-135639 and/or the 3GPP Standards because R1- 132296 and R1-135639 were proposal aimed at improvements to the eIMTA feature in 3GPP LTE, which is defined by the 3GPP Standards.

A person of ordinary skill in the art would have been motivated to combine the U.S. Patent Publication No. 2017/0055257 ("Zhang-257") in combination withU.S. Patent Publication No. 2010/0034157 ("Stolyar-157") as both discuss dynamic allocation of resources and the procedures for dynamic allocation of resources. Moreover, Zhang-257 and Stolyar-157 are analogous because they both discuss the dynamic allocation of wireless communication resources.

A person of ordinary skill in the art would have been motivated to combine the U.S. Patent Publication No. 2017/0055257 ("Zhang-257") in combination with International Patent Publication No. WO2009/050649 ("Ho-649") as both discuss dynamic allocation of resources and the procedures for dynamic allocation of resources. Moreover, Zhang-257 and Ho-649 are analogous because they both discuss the dynamic allocation of wireless communication resources.

A person of ordinary skill in the art would have been motivated to combine the U.S. Patent Publication No. 2017/0055257 ("Zhang-257") in combination with U.S. Patent Publication No. 2014/0341051 ("Gaal-051") as both discuss dynamic allocation of resources and the procedures

for dynamic allocation of resources. Moreover, Zhang-257 and Gaal-051 are analogous because they both discuss the dynamic allocation of wireless communication resources.

A person of ordinary skill in the art would have been motivated to combine the U.S. Patent Publication No. 2017/0055257 ("Zhang-257") in combination with R1-132296 and/or R1-135639, as each discuss dynamic allocation of resources and the procedures for dynamic allocation of resources.

A person of ordinary skill in the art would have been motivated to combine the U.S. Patent Publication No. 2010/0034157 ("Stolyar-157") in combination with International Patent Publication No. WO2009/050649 ("Ho-649") as both discuss dynamic allocation of resources and the procedures for dynamic allocation of resources. Moreover, Stolyar-157 and Ho-649 are analogous because they both discuss the dynamic allocation of wireless communication resources.

A person of ordinary skill in the art would have been motivated to combine the U.S. Patent Publication No. 2010/0034157 ("Stolyar-157") in combination with U.S. Patent Publication No. 2014/0341051 ("Gaal-051") as both discuss dynamic allocation of resources and the procedures for dynamic allocation of resources. Moreover, Stolyar-157 and Gaal-051 are analogous because they both discuss the dynamic allocation of wireless communication resources.

A person of ordinary skill in the art would have been motivated to combine the U.S. Patent Publication No. 2010/0034157 ("Stolyar-157") in combination with R1-132296 and/or R1-135639, as each discuss dynamic allocation of resources and the procedures for dynamic allocation of resources.

A person of ordinary skill in the art would have been motivated to combine International Patent Publication No. WO2009/050649 ("Ho-649") in combination with R1-132296 and/or R1-

135639, as each discuss dynamic allocation of resources and the procedures for dynamic allocation of resources.

A person of ordinary skill in the art would have been motivated to combine the U.S. Patent Publication No. 2014/0341051 ("Gaal-051") in combination with R1- 132296 and/or R1-135639, as each discuss dynamic allocation of resources and the procedures for dynamic allocation of resources.

A person of ordinary skill in the art would have been motivated to combine the U.S. Patent Publication No. 2014/0341051 ("Gaal-051") in combination with International Patent Publication No. WO2009/050649 ("Ho-649") as both discuss dynamic allocation of resources and the procedures for dynamic allocation of resources. Moreover, Gaal-051 and Ho-649 are analogous because they both discuss the dynamic allocation of wireless communication resources.

A person of ordinary skill in the art would have been motivated to combine the 3GPP Standards in combination with LTE for UMTS: Evolution to LTE-Advanced, 2d Ed., Edited by Holma, H. and Toskala, A. (2011) ("Holma and Toskala (2011)") as the 3GPP standards show the standardization of the methods and systems disclosed in Holma and Toskala (2011). A POSITA would have looked to Holma and Toskala 2011 as it describes textbook principles about the standard. Moreover, both references discuss TDD UL-DL configuration and resource allocation scheme. Further the 3GPP Standards and Holma and Toskala 2011 are analogous art as they both disclose TDD UL-DL configuration and allocation schemes.

A POSITA would have had a reasonable expectation of success in making any such modifications. A POSITA would have understood that these references, as well as the POSITA's

knowledge, disclose interrelated teachings based on routine technologies and would have been amenable to various well-understood and predictable combinations.

E. Lack of Secondary Indicia of Nonobviousness

Samsung is not aware of any evidence that would tend to establish any secondary considerations of non-obviousness. This lack of evidence further renders the Asserted Claims obvious. Proving any such secondary considerations is Cobblestone's burden. *See, e.g.*, *ZUP, LLC v. Nach Mfg., Inc.*, 896 F.3d 1365, 1373 (Fed. Cir. 2018) ("[A] patentee bears the burden of production with respect to evidence of secondary considerations of nonobviousness."). Accordingly, Samsung reserves all rights regarding its full contention in this respect until after Cobblestone completes its final and binding disclosure of any such evidence and contentions. In the meantime, Samsung note the complete lack of any such evidence in the record.

Cobblestone has disclosed no evidence of, and Samsung knows of no viable evidence to suggest:

- **The alleged invention's commercial success**. Indeed, no products are known to practice the Asserted Claims. To the extent Cobblestone asserts that Samsung's products practice the Asserted Patents, Samsung denies that assertion and incorporates its responses to date and any future contentions, expert reports, and testimony. Further, Samsung knows of no nexus between any commercial success and the Asserted Claims. *See, e.g., Windsurfing Int'l Inc. v. AMF* , 782 F.2d 995 (Fed. Cir. 1986) (considerations such as intervening, non-covered technological innovations, popularity of accessories, and advertising expense are all relevant to the nexus determination). If any commercial success is due to any of the concepts discussed in the Asserted Patents, those concepts

are also present in the prior art, as described above, and thus do not support any commercial success that is relevant to the question of obviousness. *See Tokai Corp. v. Easton Enters, Inc.* , 632 F.3d 1358, 1369–70 (Fed. Cir. 2011) ("If commercial success is due to an element in the prior art, no nexus exists."); *In re Huai-Hung Kao* , 639 F.3d 1057, 1068 (Fed. Cir. 2011) ("Where the offered secondary consideration actually results from something other than what is both claimed and *novel* in the claim, there is no nexus to the merits of the claimed invention."); *Ormco Corp. v. Align Tech., Inc.* , 463 F.3d 1299, 1312 (Fed. Cir. 2006) ("[I]f the feature that creates the commercial success was known in the prior art, the success is not pertinent.").

- **Alleged commercial success via licensning**. Cobblestone has presented no evidence of commercial success via a licensing program.
- **Long felt but unresolved needs**. Cobblestone has presented no evidence of any long felt and unresolved need.
- **No industry praise.** There is also no evidence of industry praise for the alleged invention of the Asserted Patents or any functionality that allegedly practices the Asserted Patents. To the extent any praise is related to any functionality that allegedly practices the Asserted Patents, that praise is not due to the allegedly novel features of the Asserted Patents, but instead only to features present in the prior art, which is not a sufficient nexus to be relevant to the question of industry praise for purposes of obviousness. *See Muniauction, Inc. v. Thomson Corp.*, 532 F.3d 1318, 1328 (Fed. Cir. 2008). Praise of Samsung's mobile phones or of certain Google Android features is not praise of the Asserted Patents.

- **Unexpected results**: No evidence of any such unexpected results is known. As discussed above, the concepts contained in the Asserted Claims were already combined in the same manner as the asserted. These prior art systems, as described in the above-referenced exhibits, disclosed the same combination of elements, and the same result of that combination, that is recited in the claim. Thus, there were no unexpected results that arose from combining the well-known elements in the Asserted Claims.
- **The failure of others**. No evidence of any such failure is known.
- **Skepticism by experts**. No experts or person of skill expressed skepticism about implementing the alleged inventions.
- **Teaching away by others**. No evidence of any such teaching is known.
- **Recognition of a problem**. As discussed above, the industry recognized the problem and had already discussed multiple approaches that implemented the Asserted Claims to solve that problem.
- **Copying of the alleged invention by competitors**. No evidence of any such copying is known. *See Amazon.com, Inc. v. Barnesandnoble.com, Inc.*, 239 F.3d 1343, 1366 (Fed. Cir. 2001) (allegedly copied feature must be an embodiment of the patented claims).

V. OBVIOUSNESS-TYPE DOUBLE PATENTING

The asserted claims are invalid due to obviousness-type double patenting.

As the Federal Circuit discussed in *In re Hubbell*, obviousness-type double patenting has two separate and independent rationales:

> There are two justifications for obviousness-type double patenting. The first is "to prevent unjustified timewise extension of the right to exclude granted by a patent no matter how the extension is brought about." *Van Ornum*, 686 F.2d at 943-44 (quotation and citation

> omitted). The second rationale is to prevent multiple infringement suits by different assignees asserting essentially the same patented invention. *Fallaux*, 564 F.3d at 1319 (recognizing that "harassment by multiple assignees" provides "a second justification for obviousness-type double patenting"); *see also* Chisum on Patents § 9.04[2][b][ii] ("The possibility of multiple suits against an infringer by assignees of related patents has long been recognized as one of the concerns behind the doctrine of double patenting.").

See In re Hubbell, 709 F.3d 1140, 1145 (Fed. Cir. 2013).

Analyzing obviousness-type double patenting takes a two-step process. First, the differences between the claims of the patent being used as a reference and the claims at issue are identified. *Georgia-Pacific v. US Gypsum*, 195 F.3d 1322, 1326 (Fed. Cir. 1999) ("[A]nalysis of the claims at issue is the first step in determining if the second invention is merely an obvious variation of the first.... Because these two claims are so similar, we must look to see if there is anything to distinguish claim 1 of the '989 patent from claim 1 of the '569 patent. There are two differences between these claims."), *amended on rehearing*, 204 F.3d 1359 (Fed. Cir. 2000).

Second, whether those differences raise a patentable distinction must be determined. *Georgia-Pacific*, 195 F.3d at 1328 (finding that "[t]hese differences are not sufficient to render the claims patentably distinct"). "A later patent claim 'is not patentably distinct from an earlier claim if the later claim is obvious over, or anticipated by, the earlier claim.'" *Hubbell*, 709 F.3d at 1145 (*quoting Eli Lilly & Co. v. Barr Labs., Inc.*, 251 F.3d 955, 968 (Fed. Cir. 2001)). Where the recited claims at issue are not explicitly disclosed in the claims of the patent being used as a reference, Samsung may rely on the knowledge of a person of ordinary skill in the art, admitted prior art, or disclosure in the prior art references relied upon by Samsung.

VI. INVALIDITY UNDER 35 U.S.C. § 112

Cobblestone has not yet provided a claim construction for many of the terms and phrases that Samsung anticipates will be in dispute. Samsung, therefore, cannot provide a complete list of its § 112 defenses because Samsung does not know whether Cobblestone will proffer a construction for certain terms and phrases that is broader than, or inconsistent with, the construction that would be supportable by the disclosure set forth in the specification.

Nevertheless, Samsung contends that, at least under Cobblestone's actual and/or apparent application of the claims, the Asserted Claims are invalid based on inadequate written description and/or a lack of enablement under 35 U.S.C. § 112 ¶ 1, and/or based on indefiniteness under 35 U.S.C. § 112 ¶ 2.

Samsung's aforementioned identification of prior art that anticipates and/or renders obvious particular claim elements, including the attached claim charts, should not be deemed as an admission that any claim element satisfies the requirements of 35 U.S.C. § 112. While Samsung asserts below that a claim is invalid under 35 U.S.C. § 112 (such as because of a failure to particularly point out and distinctly claim the alleged invention, failure to provide written description support in the specification, and/or failure to enable one of ordinary skill in the art to make and use the alleged invention), Samsung has nonetheless provided prior art disclosures that anticipate or render obvious the claim on the assumption that Cobblestone will contend those claims are definite, are supported by an adequate written description, and are adequately enabled.

A. Lack of Written Description and Enablement Under 35 U.S.C. § 112 ¶ 1

Certain claims in the Asserted Patents are invalid for lack of written description. Section 112 requires that a patent specification "contain a written description . . . of the manner and process of making and using [the invention] in such full, clear, concise and exact terms as to enable any

person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same." 35 U.S.C. § 112 ¶ 1. A patent's written description "must clearly allow persons of ordinary skill in the art to recognize that [the inventor] invented what is claimed." *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). The disclosure must "convey to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date." *Id.* The level of detail required to satisfy the written description requirement varies depending on the nature and scope of the claims and on the complexity and predictability of the relevant technology, but a "mere wish or plan" for obtaining the alleged invention does not satisfy the written description requirement. *Novozymes A/S v. DuPont Nutrition Biosciences APS*, 723 F.3d 1336, 1344 (Fed. Cir. 2013). Put another way, "a description that merely renders the invention obvious does not satisfy the requirement." *Ariad*, 598 F.3d at 1351. Instead, "all the limitations must appear in the specification." *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1572 (Fed. Cir. 1997). Samsung contends that, at least under Cobblestone's actual and/or apparent application of the claims, the specifications of at least one or more of the Asserted Patents do not include a sufficient written description supporting the claims. Moreover, Samsung contends that Cobblestone's actual and/or apparent application of the Asserted Claims covers a broader scope than is justified and/or supported by the written description provided in the specifications of at least one or more of the Asserted Patents. *Tronzo v. Biomet, Inc.*, 156 F.3d 1154, 1159 (Fed. Cir. 1998); *LizardTech, Inc. v. Earth Res. Mapping, Inc.*, 424 F.3d 1336, 1346 (Fed. Cir. 2005); *ICU Med., Inc. v. Alaris Med. Sys., Inc.*, 558 F.3d 1368 (Fed. Cir. 2009).

Section 112 likewise requires that the specification "enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the" alleged invention.

35 U.S.C. § 112 ¶ 1. A claim is not enabled if, "at the effective filing date of the patent, one of ordinary skill in the art could not practice their full scope without undue experimentation." *Wyeth and Cordis Corp. v. Abbott Labs.*, 720 F.3d 1380, 1384 (Fed. Cir. 2013). "This important doctrine prevents both inadequate disclosure of an invention and overbroad claiming that might otherwise attempt to cover more than was actually invented." *MagSil Corp. v. Hitachi Global Storage Techs., Inc.*, 687 F.3d 1377, 1381 (Fed. Cir. 2012). Samsung contends that, at least under Cobblestone's actual and/or apparent application of the claims, the specifications of at least one or more of the Asserted Patents do not enable any person skilled in the relevant art to make and use the alleged inventions of the Asserted Claims without undue experimentation.

Furthermore, under Cobblestone's actual and/or apparent application of the claims, the specifications of at least one or more of the Asserted Patents do not enable the broad scope of the Asserted Claims as Cobblestone asserts. Samsung contends that Cobblestone's actual and/or apparent application of the Asserted Claims covers a broader scope than is justified, and certainly broader than is enabled in the specifications. As explained below, the specifications of at least one or more of the Asserted Patents have not enabled a person of ordinary skill in the art at the time of the alleged invention to perform the full scope of all Asserted Claims.

Each of the asserted claims below are invalid because, at least to the extent Cobblestone contends any of the following limitations should be construed to encompass Samsung's accused instrumentalities, the specifications fail to provide written description and/or an enabling disclosure of at least the following limitations:

1. '802 patent (claims 1-4, 6-10, 13, 14, 17)

- **Claim 1:** "transmitting first information across a first frequency range using a wireless transmitter"
- **Claim 1:** "transmitting second information across a second frequency range using the same wireless transmitter"
- **Claim 10:** "up-converting the first analog signal to a first RF center frequency to produce a first up-converted analog signal"
- **Claim 10:** "up-converting the second analog signal to a second RF center frequency greater than the first center RF frequency to produce a second up-converted analog signal"
- **Claim 10:** "combining the first up-converted analog signal and the second up-converted analog signal to produce a combined up-converted signal"
- **Claim 17:** "a first up-converter circuit having a first input coupled to receive the first analog signal and a second input coupled to receive a first modulation signal having a first RF frequency"
- **Claim 17:** "a second up-converter circuit having a first input coupled to receive the second analog signal and a second input coupled to receive a second modulation signal having a second RF frequency"
- **Claim 14:** "down-converting the amplified received up-converted signal using a first down-converter and a signal corresponding to the first RF center frequency to produce a fourth analog signal corresponding to the first analog signal"
- **Claim 14:** "down-converting the amplified received up-converted analog signal using a second down-converter and a signal corresponding to the second RF center frequency to produce a fifth analog signal corresponding to the second analog signal"

2. '196 patent (claims 1-5, 7, 10, 12, 14, 17, 18, 20, 21)

- **Claims 1, 17, 20:** "cycling over time through a coverage sequence that includes providing a first coverage configuration and providing a second coverage configuration"
- **Claims 1, 17, 20**: "providing the first coverage configuration includes transmitting a first beam of a first network that is configured to provide coverage for the group of devices"
- **Claims 1, 17, 20**: "providing the second coverage configuration includes transmitting a second beam of the first network that is narrower than the first beam and configured to provide coverage to at least one continuous use device of the group of devices"
- **Claims 1, 17, 20**: "the at least one continuous use device being actively involved in a substantially continuous service with the network, and providing coverage by a second network to a plurality of interval use devices of the group of devices"
- **Claim 2**: "wherein the providing the second coverage configuration comprises determining a direction of transmission for the second beam based at least in part on a location of the at least one continuous use device
- **Claim 3**: "wherein the second beam of the first network is further configured to provide coverage to a second continuous use device of the group of devices"
- **Claim 4**: "wherein a subsequent iteration of providing the second coverage configuration includes transmitting the second beam of the first network configured to provide coverage to a second continuous use device, and wherein the at least one continuous use device has transitioned to being an interval use device"
- **Claim 5**: "wherein the first network and the second network are different network types"

- **Claims 7, 18, 21**: "wherein the first network and the second network are the same network types, and wherein the at least one continuous use device is allowed access to the second beam based on an admission control parameter"
- **Claim 10**: "wherein the at least one continuous use device is engaged in at least one of a voice call, a download, or a content streaming"
- **Claim 12**: "wherein the second beam is narrower than the first beam in at least one of a horizontal plane or a vertical plane"
- **Claim 20**: "a processor coupled to the machine readable medium to execute the instructions"
- **Claim 20**: "an adaptive antenna configured to transmit the first beam and the second beam"
- **Claim 21**: "and the adaptive antenna is further configured to transmit a third beam of the second network"

3. '347 patent (claims 1-4, 6-12, 14-17, 19-23)

- **Claim 1:** "predistorting a second signal at the transmitter in a time domain, a frequency domain, and a spatial domain, according to the channel estimation based on the first signal"
- **Claim 1:** "transmitting the predistorted second signal from the transmitter to the receiver via the first propagation path"
- **Claim 1:** "receiving the predistorted second signal at the receiver"
- **Claim 6**: "equalizing the predistorted second signal at the receiver"
- **Claim 7**: "equalizing the predistorted second signal is performed using a joint processing technique in a coordinated multiple-point (CoMP) system"
- **Claim 8**: "wherein the transmitter is configured to predistort a second signal in a time domain, a frequency domain, and a spatial domain according to the channel estimation that

is based on the first signal and received from the receiver and to transmit the predistorted second signal to the receiver via the first propagation path"

- **Claim 14**: "wherein the receiver is further configured to equalize the predistorted second signal"
- **Claim 15**: "predistorting a second signal in a time domain, a frequency domain, and a spatial domain according to the channel estimation based on the first signal; and transmitting the predistorted second signal from the transmitter to the receiver via the first propagation path"
- **Claim 19**: "receiving a second signal via the first propagation path, the second signal predistorted in a time domain, a frequency domain, and a spatial domain according to the channel estimation based on the first signal"
- **Claims 1, 2, 3, 8, 9, 10, 15, 16, 19, 20, 21**: "propagation paths / plurality of propagation paths"
- **Claims 2, 9, 16, 20**: "wherein the path parameter information of the first propagation path includes at least one of an estimation of a delay, an estimation of a Doppler frequency, an estimation of a direction of arrival, an estimation of a direction of departure, and an estimation of a complex amplitude of the first propagation path"
- **Claims 3, 10, 21:** "wherein the path parameter information of the first propagation path further includes an estimation of a polarization status of the first propagation path"
- **Claims 4, 11, 22:** "herein the path parameter information is obtained by at least one estimation technique of the group consisting of a maximum-likelihood estimation algorithm, periodogram, correlatorgram, spectral-based methods, Bartlett beamformers,

Capon beamformers, subspace-based techniques, MUSIC (MUltiple SIgnal Classification), ESPRIT (Estimation of Signal Parameters via Rotational Invariance Techniques), approximation of the maximum-likelihood method based on iterative schemes, SAGE (Space-Alternating Generalized Expectation-maximization), RiMAX (Richter's Maximum Likelihood method), maximum-a-posteriori based methods, Evidence Framework, Bayesian techniques, tracking algorithms, Kalman filtering techniques, enhanced Kalman filtering techniques, particle filtering techniques, and least-square-error methods"

- **Claim 8**: "wherein the receiver is configured to receive a first signal that is transmitted along a first propagation path of the plurality of propagation paths from the transmitter, perform a channel estimation based on the first signal to obtain path parameter information of the first propagation path, and send the channel estimation that includes the path parameter information to the transmitter via the first propagation path"
- **Claims 12, 17, 23**: "wherein the transmitter and the receiver each comprise multiple antennas in a multiple-input and multiple-output (MIMO) wireless communication system or a single antenna in a single-input and single-output (SISO) wireless communication system
- **Claim 15** "transmitting a first signal from the transmitter to the receiver via a first propagation path of the plurality of propagation paths"
- **Claim 15**: "receiving a channel estimation based on the first signal, the channel estimation including path parameter information of the first propagation path"
- **Claim 19**: "receiving a first signal at the receiver via a first propagation path of the plurality of propagation paths"

- **Claim 19**: "performing a channel estimation based on the first signal to obtain path parameter information of the first propagation path"
- **Claim 19**: "sending the channel estimation that includes the path parameter information to the transmitter"

4. '888 Patent (claims 9, 10, 12, 20, 21, 23)

- **Claim 9:** "a determination by the second wireless network that the wireless device is not currently covered by the first wireless network but is capable of being covered by the first wireless network"
- **Claim 9:** "adapting one or more beams of an antenna array to facilitate coverage of the wireless device by the first wireless network"
- **Claim 12:** "adapting one or more beams based, at least in part, on one of a predetermined network load placed on the first wireless network due to the handoff of the wireless device or an effect of adapting one or more beams on other wireless devices"
- **Claim 23:** "cause the beam to be adapted comprises to cause a beam to be adapted based, at least in part on one of a network load placed on the first wireless network due to the handoff of the wireless device of an impact of adapting one or more beams on other wireless devices"
- **Claim 20:** "adoption manager"
- **Claim 20:** "an antenna array configured to generate one or more adaptable beams to modify a coverage area for the first wireless network"
- **Claim 20:** "a determination by the second wireless network that the wireless device is capable of being covered by the first wireless network"

- **Claim 20:** "cause a beam from among the one or more adaptable beams to be adapted in order to enable the wireless device to be covered by the first wireless network"
- **Claim 23:** "to cause the beam to be adapted comprises to cause a beam to be adapted based, at least in part, on one of a network load placed on the first wireless network due to the handoff of the wireless device"

5. '361 Patent (claims 10-13, 15, 17)

- **Claims 10-13, 15:** "quality status module"
- **Claims 10-13, 15:** "scheduler module"
- **Claims 10-13, 15:** "determine, based on the quality status of the first frequency spectrum resource, that the first frequency spectrum resource is a sub-optimal resource, for the uplink channel and the downlink channel, relative to other frequency spectrum resources that are available for use by the wireless base station"
- **Claim 17:** "determine, based on the quality status, that the first frequency spectrum resource is a sub-optimal resource, for the uplink channel and the downlink channel, relative to other frequency spectrum resources that are available for use by the base station"
- **Claims 10-13, 15, 17:** "sub-optimal resource"
- **Claims 10-13, 15, 17:** "determine a quality status of a first frequency spectrum resource / determine a respective quality status of a first frequency spectrum resource and second frequency spectrum resource"
- **Claim 17:** "determine that a channel quality indicator (CQI) of the first frequency spectrum resource is less than a respective CQI of one or more other frequency spectrum resources that are available for use by the base station"

- **Claim 17:** "determine that a received interference power (RIP) of the first frequency spectrum resources is greater than a respective RIP of the one or more other frequency spectrum resources that are available for use by the base station"
- **Claims 10-13, 15, 17:** "shared resource pool"
- **Claims 10-13, 15, 17:** "initial directional allocation of communication resources"
- **Claims 10-13, 15, 17:** "updated directional allocation of communication resources"
- **Claim 17:** "select the first frequency spectrum resource from the shared resource pool"
- **Claim 11:** "uplink resource pool"
- **Claim 11:** "downlink resource pool"
- **Claim 12:** "Current resource requests from a wireless device serviced by the wireless base station, current resource requests form the wireless base station, a number of frequency spectrum resources scheduled form an uplink resource pool for uplink channels, and a number of frequency spectrum resources scheduled for a downlink resource pool for downlink channels"
- **Claim 13:** "The initial directional allocation of frequency spectrum resources is based on current resource requests form a wireless device service by the wireless base station, and current resources requests from the wireless base station."
- **Claim 15:** "multiple resource elements associated with each of the multiple subcarriers"

B. Indefiniteness Under 35" U.S.C. § 112 ¶ 2

35 U.S.C. § 112, ¶ 2 requires that a patent claim "particularly point[] out and distinctly claim[] the subject matter which the applicant regards as his invention." 35 U.S.C. § 112, ¶ 2. Claim terms that fail to inform those skilled in the art "with reasonable certainty . . . about the

scope of the invention" fail the definiteness requirement of 35 U.S.C. § 112, ¶ 2. *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014). Samsung contends that, at least under Cobblestone's actual and/or apparent application of the claims, the Asserted Claims of the Asserted Patents fail to distinctly claim what the inventors regard as their alleged invention.

Each of the asserted claims are invalid as indefinite under 35 U.S.C. § 112 because they fail to particularly point out and distinctly claim the subject matter which the applicant regards as his invention. In particular, the following limitations, read in light of the intrinsic evidence, fail to inform those skilled in the art with reasonable certainty about the scope of the claimed inventions:

1. '802 Patent (claims 1-4, 6-10, 13, 14, 17)

- **Claim 1, 3, 6, 7, 8, 9:** "the first information"
- **Claims 1, 3, 6, 7, 8, 9:** "the second information"
- **Claim 1:** "transmitting first information across a first frequency range using a wireless transmitter"
- **Claim 1:** "transmitting second information across a second frequency range using the same wireless transmitter"
- **Claim 8:** "the first information and the second information are from the same data stream"
- **Claim 10:** "receiving a first digital signal comprising first data to be transmitted"
- **Claim 10:** "receiving a second digital signal comprising second data to be transmitted"
- **Claim 10:** "up-converting the first analog signal to a first RF center frequency to produce a first up-converted analog signal"
- **Claim 10:** "up-converting the second analog signal to a second RF center frequency greater than the first center RF frequency to produce a second up-converted analog signal"

- **Claim 17:** "a first up-converter circuit having a first input coupled to receive the first analog signal and a second input coupled to receive a first modulation signal having a first RF frequency"
- **Claim 17:** "a second up-converter circuit having a first input coupled to receive the second analog signal and a second"
- **Claim 4:** "the bandwidth of said power amplifier"

2. '196 patent (claims 1-5, 7, 10, 12, 14, 17, 18, 20, 21)

- **Claims 1, 17, 20:** "group of devices"
- **Claims 1, 17, 20**: "cycling over time"
- **Claims 1, 2, 17, 20**: "at least one continuous use device"
- **Claims 1, 17, 20**: "substantially continuous services"
- **Claims 1, 17, 20**: "a plurality of interval use devices of the group of devices"
- **Claim 3**: "a second continuous use device of the group of devices"
- **Claim 4**: "a second continuous use device, and wherein the at least one continuous use device has transitioned to being an interval use device"
- **Claim 5**: "different network types"
- **Claims 7, 18, 21**: "the same network types",
- **Claim 7:** "the at least one continuous use device is allowed access to the second beam"
- **Claims 1, 17, 20:** "cycling over time through a coverage sequence that includes providing a first coverage configuration and providing a second coverage configuration"
- **Claims 1, 17, 20**: "providing the first coverage configuration includes transmitting a first beam of a first network that is configured to provide coverage for the group of devices"

- **Claims 1, 17, 20**: "providing the second coverage configuration includes transmitting a second beam of the first network that is narrower than the first beam and configured to provide coverage to at least one continuous use device of the group of devices"
- **Claims 1, 17, 20**: "the at least one continuous use device being actively involved in a substantially continuous service with the network, and providing coverage by a second network to a plurality of interval use devices of the group of devices"
- **Claim 2**: "wherein the providing the second coverage configuration comprises determining a direction of transmission for the second beam based at least in part on a location of the at least one continuous use device"
- **Claim 3**: "wherein the second beam of the first network is further configured to provide coverage to a second continuous use device of the group of devices"
- **Claim 4**: "wherein a subsequent iteration of providing the second coverage configuration includes transmitting the second beam of the first network configured to provide coverage to a second continuous use device, and wherein the at least one continuous use device has transitioned to being an interval use device"
- **Claim 5**: "wherein the first network and the second network are different network types"
- **Claims 7, 18, 21**: "wherein the first network and the second network are the same network types, and wherein the at least one continuous use device is allowed access to the second beam based on an admission control parameter"
- **Claim 10**: "wherein the at least one continuous use device is engaged in at least one of a voice call, a download, or a content streaming"

- **Claim 12**: "wherein the second beam is narrower than the first beam in at least one of a horizontal plane or a vertical plane"
- **Claim 20**: "a processor coupled to the machine readable medium to execute the instructions"
- **Claim 20**: "an adaptive antenna configured to transmit the first beam and the second beam"
- **Claim 21**: "and the adaptive antenna is further configured to transmit a third beam of the second network"

3. '347 patent (claims 1-4, 6-12, 14-17, 19-23)

- **Claim 1:** "predistorting a second signal at the transmitter in a time domain, a frequency domain, and a spatial domain, according to the channel estimation based on the first signal"
- **Claim 1:** "transmitting the predistorted second signal from the transmitter to the receiver via the first propagation path"
- **Claim 1:** "receiving the predistorted second signal at the receiver"
- **Claim 6**: "equalizing the predistorted second signal at the receiver"
- **Claim 7**: "equalizing the predistorted second signal is performed using a joint processing technique in a coordinated multiple-point (CoMP) system"
- **Claim 8**: "wherein the transmitter is configured to predistort a second signal in a time domain, a frequency domain, and a spatial domain according to the channel estimation that is based on the first signal and received from the receiver and to transmit the predistorted second signal to the receiver via the first propagation path"
- **Claim 14**: "wherein the receiver is further configured to equalize the predistorted second signal"

- **Claim 15**: "predistorting a second signal in a time domain, a frequency domain, and a spatial domain according to the channel estimation based on the first signal; and transmitting the predistorted second signal from the transmitter to the receiver via the first propagation path"
- **Claim 19**: "receiving a second signal via the first propagation path, the second signal predistorted in a time domain, a frequency domain, and a spatial domain according to the channel estimation based on the first signal"
- **Claims 1, 2, 3, 8, 9, 10, 15, 16, 19, 20, 21**: "propagation paths / plurality of propagation paths"
- **Claim 1:** "performing a channel estimation based on the first signal to obtain path parameter information of the first propagation path"
- **Claim 1:** "receiving the predistorted second signal at the receiver"
- **Claims 2, 9, 16, 20**: "wherein the path parameter information of the first propagation path includes at least one of an estimation of a delay, an estimation of a Doppler frequency, an estimation of a direction of arrival, an estimation of a direction of departure, and an estimation of a complex amplitude of the first propagation path"
- **Claims 3, 10, 21:** "wherein the path parameter information of the first propagation path further includes an estimation of a polarization status of the first propagation path"
- **Claims 4, 11, 22:** "herein the path parameter information is obtained by at least one estimation technique of the group consisting of a maximum-likelihood estimation algorithm, periodogram, correlatorgram, spectral-based methods, Bartlett beamformers, Capon beamformers, subspace-based techniques, MUSIC (MUltiple SIgnal Classification),

ESPRIT (Estimation of Signal Parameters via Rotational Invariance Techniques), approximation of the maximum-likelihood method based on iterative schemes, SAGE (Space-Alternating Generalized Expectation-maximization), RiMAX (Richter's Maximum Likelihood method), maximum-a-posteriori based methods, Evidence Framework, Bayesian techniques, tracking algorithms, Kalman filtering techniques, enhanced Kalman filtering techniques, particle filtering techniques, and least-square-error methods"

- **Claim 8**: "wherein the receiver is configured to receive a first signal that is transmitted along a first propagation path of the plurality of propagation paths from the transmitter, perform a channel estimation based on the first signal to obtain path parameter information of the first propagation path, and send the channel estimation that includes the path parameter information to the transmitter via the first propagation path"
- **Claims 12, 17, 23**: "wherein the transmitter and the receiver each comprise multiple antennas in a multiple-input and multiple-output (MIMO) wireless communication system or a single antenna in a single-input and single-output (SISO) wireless communication system"
- **Claim 15**: "receiving a channel estimation based on the first signal, the channel estimation including path parameter information of the first propagation path"
- **Claim 19**: "receiving a first signal at the receiver via a first propagation path of the plurality of propagation paths"
- **Claim 19**: "performing a channel estimation based on the first signal to obtain path parameter information of the first propagation path"

- **Claim 19**: "sending the channel estimation that includes the path parameter information to the transmitter"

4. '888 Patent (claims 9, 10, 12, 20, 21, 23)

- **Claim 9:** "a determination by the second wireless network that the wireless device is not currently covered by the first wireless network but is capable of being covered by the first wireless network"
- **Claim 9:** "adapting one or more beams of an antenna array to facilitate coverage of the wireless device by the first wireless network"
- **Claim 12:** "adapting one or more beams based, at least in part, on one of a predetermined network load placed on the first wireless network due to the handoff of the wireless device or an effect of adapting one or more beams on other wireless devices"
- **Claim 23:** "cause the beam to be adapted comprises to cause a beam to be adapted based, at least in part on one of a network load placed on the first wireless network due to the handoff of the wireless device of an impact of adapting one or more beams on other wireless devices"
- **Claim 20:** "adoption manager"
- **Claim 20:** "modify a coverage area"
- **Claim 20:** "In order to enable the wireless device to be covered by the first wireless network"
- **Claim 9, 10:** "handoff request"

- **Claim 23:** "to cause the beam to be adapted comprises to cause a beam to be adapted based, at least in part, on one of a network load placed on the first wireless network due to the handoff of the wireless device"
- **Claim 21:** "to receive the handoff request comprises to receive the handoff"

5. '361 Patent (claims 10-13, 15, 17)

- **Claims 10-13, 15:** "quality status module"
- **Claims 10-13, 15:** "scheduler module"
- **Claims 10-13, 15:** "determine, based on the quality status of the first frequency spectrum resource, that the first frequency spectrum resource is a sub-optimal resource, for the uplink channel and the downlink channel, relative to other frequency spectrum resources that are available for use by the wireless base station"
- **Claim 17:** "determine, based on the quality status, that the first frequency spectrum resource is a sub-optimal resource, for the uplink channel and the downlink channel, relative to other frequency spectrum resources that are available for use by the base station"
- **Claims 10-13, 15, 17:** "sub-optimal resource"
- **Claims 10-13, 15, 17:** "determine a quality status of a first frequency spectrum resource / determine a respective quality status of a first frequency spectrum resource and second frequency spectrum resource"
- **Claims 10-13, 15, 17:** "quality status"
- **Claims 10-13, 15, 17:** "shared resource pool"
- **Claims 10-13, 15, 17:** "initial directional allocation of communication resources"
- **Claims 10-13, 15, 17:** "updated directional allocation of communication resources"

- **Claim 17:** "select the first frequency spectrum resource from the shared resource pool"
- **Claim 11:** "uplink resource pool"
- **Claim 11:** "downlink resource pool"
- **Claim 13:** "The initial directional allocation of frequency spectrum resources is based on current resource requests form a wireless device service by the wireless base station, and current resources requests from the wireless base station."
- **Claim 15:** "multiple resource elements associated with each of the multiple subcarriers"

VII. DOCUMENT PRODUCTION

Pursuant to Patent Rule 3-4, Samsung is concurrently producing the prior art identified in these Invalidity Contentions, but Samsung is not required to produce the prior art in the file histories of the Asserted Patents.

In addition, based on investigations to date, Samsung is concurrently producing and/or making available for inspection source code, specifications, schematics, flow charts, artwork, formulas, or other documentation sufficient to show the operation of any aspects or elements of the Accused Instrumentalities identified by Cobblestone in its P.R. 3-1(c) chart.

Samsung reserves the right to supplement these productions with additional documentation, in accordance with the Federal Rules of Civil Procedure, the Local Rules, the Court's orders and other applicable rules and statutes.

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By */s/ Sean Pak*

Sean Pak
California Bar No. 219032 (*pro hac vice*)
seanpak@quinnemanuel.com
Iman Lordgooei
California Bar No. 251320 (admitted in E.D. Tex.)
imanlordgooei@quinnemanuel.com
QUINN EMANUEL URQUHART & SULLIVAN, LLP
50 California Street, 22nd Floor
San Francisco, CA 94111
Tel: 415-875-6600
Fax: 415-875-6700

Victoria F. Maroulis
California Bar No. 202603 (admitted in E.D. Tex.)
victoriamaroulis@quinnemanuel.com
QUINN EMANUEL URQUHART & SULLIVAN, LLP
555 Twin Dolphin Drive, 5th Floor
Redwood Shores, CA 94065
Tel : 650-801-5000
Fax: 650-801-5100

Kevin Hardy
D.C. Bar No. 473941 (admitted in E.D. Tex.)
kevinhardy@quinnemanuel.com
QUINN EMANUEL URQUHART & SULLIVAN, LLP
1300 I Street, N.W., Suite 900
Washington, DC 20005
Tel: 202.538.8000
Fax: 202.538.8100

Melissa R. Smith
Texas State Bar No. 24001351
melissa@gillamsmithlaw.com
GILLAM & SMITH, LLP
303 South Washington Avenue
Marshall, Texas 75670
Phone: (903) 934-8450
Fax: (903) 934-9257

Counsel for Defendants Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a true and correct copy of the foregoing was served on counsel of record for Plaintiff via electronic mail on June 18, 2024.

/s/ Brady Huynh
Brady Huynh